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                County traffic safety  
                improvement study



# BUTTE-SILVER BOW COUNTY

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## Traffic Safety Improvement Plan

*Prepared For:* **Butte-Silver Bow County and the Highway  
Traffic Safety Division of the Montana  
Department of Justice**

*August, 1990*

*Prepared by:*

 **CLETE DAILY AND ASSOCIATES**  
TRAFFIC & TRANSPORTATION ENGINEERS  
524 W. Lawrence • P.O. Box 223  
Helena, Montana 59624

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# BUTTE-SILVER BOW COUNTY TRAFFIC SAFETY IMPROVEMENT STUDY

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HIGHWAY TRAFFIC SAFETY DIVISION**

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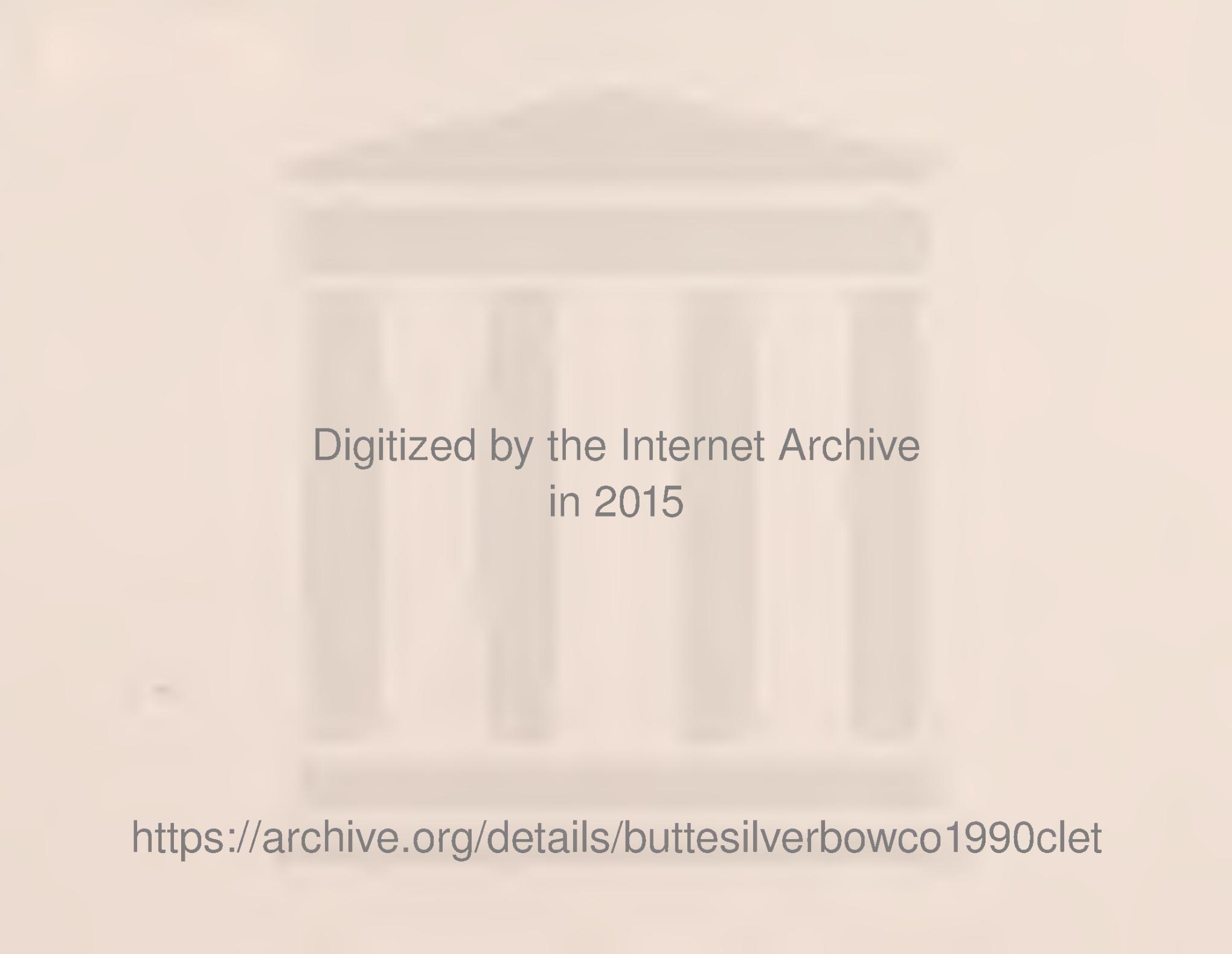
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*August, 1990*

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## **CHAPTER I. INTRODUCTION**

### **A. PURPOSE**

The purpose of this report is to analyze the cause of accidents at locations on the county road system where accident reports indicate a cluster of accidents, and to develop an improvement plan for those locations.

### **B. COUNTY ROAD ACCIDENT HISTORY**

The road system in Butte-Silver Bow County can be divided into three categories:

- 1) on-system roads which are part of the Federal Aid Highway System are under the jurisdiction of the Montana Department of Highways;
- 2) off-system roads that come under the jurisdiction of federal or state agencies such as the Forest Service, Bureau of Land Management, or Fish, Wildlife and Parks; and
- 3) off-system roads that come under the jurisdiction of Butte-Silver Bow County.

This study covers the roads in Category 3.

The Butte-Silver Bow County rural road system has 570 miles of road, of which 296 miles are dirt or gravel surfaced and 274 miles are paved. The average road mileage for the 56 counties in Montana is 1,343 miles with an average of 1,099 miles with dirt or gravel surfaces and 244 miles paved. Butte-Silver Bow County roads carry higher traffic volumes than most county roads in the state as indicated by the high percentage of paved roads. All but one of the high accident locations were located on paved roads in the urban area.

Reported accidents on county roads in Butte-Silver Bow County have decreased over the past three years. In 1986 there were 80 reported accidents compared to 50 accidents in 1988 on

the county road system, a decrease of 38 percent. Spot safety improvements have probably been responsible for a portion of this decrease. For example, STOP signs installed at the intersections of Marcia/Wilson and Thomas/Yak/Hancock appear to have eliminated accidents at those locations in 1989. These type of improvements are the most cost effective means to reduce accidents and, as shown in the cost/benefit analysis, can be expected to show high user savings for each dollar spent.

### **C. COUNTY ACCIDENT LOCATIONS**

The Department of Justice maintains records of all reported accidents in the state. The consultant tabulated the accidents on the county road system by location. Locations with clusters of accidents were analyzed to arrive at 17 locations where a detailed analysis was carried out. Based on the analysis, short and long-term improvements were developed for each site. Chapter II explains the study methods in detail. The locations of the sites are shown on *Figure 1A* on the following page.



## **CHAPTER II. STUDY METHODS**

The determination of improvements required to reduce accidents at the selected sites involves eight basic steps. These are outlined in the following sections.

### **A. ACCIDENT ANALYSIS**

Department of Justice records were used to obtain the accident reports at each of the selected sites. The accident reports were reviewed and pertinent information was plotted on a preliminary sketch of each location. This information included: a symbolic sketch showing vehicle paths, point of collision, collision type, time of day, road condition, and number of injuries or fa-

talities. The sketches were used to determine trends and patterns.

### **B. PRELIMINARY FIELD SURVEY**

The consultant prepared a list of 36 sites based on the location of accident clusters. These were reviewed with the Highway Traffic Safety Division, Traffic Engineer, the Butte-Silver Bow County Road Superintendent and the County Surveyor. The list was reduced to 17 sites. A detailed survey was made at these sites.

### **C. DETAILED FIELD SURVEY**

A two-man survey crew visited each site to collect detailed data. The following information was collected:

#### **1. Site Survey**

Each site was surveyed so that an accurate plan of the site could be prepared showing roadway alignment, grades, superelevations, and other physical characteristics. Surrounding topography was also surveyed showing sign and other traffic control device locations, fences, utility poles, trees, and other roadside objects. The survey was extended to take in all features which could have an effect on the road user such as background roads that appear to be an extension of the roadway or utility lines or waterways which continue straight while the roadway turns.

These features sometimes create driver expectancy resulting in off-road accidents.

#### **2. Traffic Counts**

Manual peak hour traffic counts were taken at sites where Montana Department of Highways traffic counts were not available. The counts were converted to 1990 Average Daily Traffic by applying a 24-hour expansion factor.

#### **3. Sight Distance**

The driver sight distance on all approaches at each site was measured.

#### **4. Safe Speed Study**

Curve data was used to calculate the safe speed for each curve. This was supplemented with the estimated friction factor based on surface type to arrive at advisory speeds for sites having curves.

#### **5. Driver Expectancy and Information System Evaluation**

Each member of the survey crew independently rated the driver expectancy and informational system of each site.

Driver expectancy is a measure of a driver's perception of the roadway and the amount of time a driver has to react and take the necessary actions to pass safely through the location. The rating ranges from no unexpected or unusual actions required to very unusual situations which would surprise many unfamiliar drivers.

The information system evaluation con-

sisted of determining if the roadway design and traffic control devices were sufficient to give the driver the information required in sufficient time to take the necessary actions to safely negotiate the location. Ratings for the information system range from easy and obvious information interpretation to the lack of important information.

The evaluation forms used for the driver expectancy and information system evaluation are shown in *Figures 1 and 2*.

## **6. Site Sketches**

The field survey data was used to prepare a sketch of each site showing the pertinent features. These include alignment, grade, roadway, dimensions, approaches, ditches, foliage, roadside objects, traffic control devices, surface type and condition, sight distance and surrounding features that may affect the function of the roadway. The sketches have been used as a base to show the existing conditions, accident diagrams and recommended improvements contained in the site analysis section of this report (Chapter IV).

## **D. CALCULATE HAZARD INDEX**

A hazard index was calculated for each site. The hazard index calculation form along with the various indicator values are shown in *Figures 3 through 10*. The factors entering into the hazard index

calculation are as follows: (*all figures and tables are at the end of this chapter*)

### **1. Number of Accidents**

The average annual number of accidents for the five-year period from 1985 through 1989 was used to calculate this indicator (*see Figure 3*).

### **2. Accident Rate**

The accident rate is expressed in accidents per million vehicle miles of travel. The average daily traffic (ADT) as determined from the manual counts were used to compute this indicator (*see Figure 4*).

### **3. Accident Severity**

Accident severity relates property damages, bodily injuries and fatalities to dollar costs. The unit costs shown in *Figure 5* were used to calculate this indicator (*see Figure 5 and Table 3*).

### **4. Volume/Capacity Ratio**

The 1990 average daily traffic and the 24-hour capacity (Level of Service) as calculated using the methods set forth in the *1985 Highway Capacity Manual* were used to calculate this indicator (*see Figure 6*).

### **5. Sight Distance**

Sight distances on all approaches were determined by the field survey. This was related to the required stopping distance to determine the indicator value of each location (*see Figure 7*).

## **6. Driver Expectancy Problems and Information System Deficiencies**

The average rating values from the two independent field ratings were used to determine the values for these two indicators (*see Figure 1, 2, 8 and 9*).

### **7. Hazard Index**

The hazard index for each site was calculated by combining the seven hazard rating indices. The hazardousness of each location was used to rank the sites.

## **E. DEVELOP RECOMMENDED IMPROVEMENT PLANS**

A recommended improvement plan has been developed based on the layout sketch, accident analysis, field notes, traffic volumes and movements, photos, site inspections, and local interviews. The improvements are shown on the location sketch for each site contained in Chapter IV.

## **F. COSTS**

Costs provided by the Montana Department of Highways as approved by the Federal Highway Administration will be paid to the county under a "Work at Agreed Price" contract. The approved costs have been used to determine improvement costs at each site. The costs are shown in *Table 1*.

The costs in *Table 4* are used to determine the cost factor which is the improvement cost per vehicle entering the site over a five-year period. The five-year period represents the reasonable design life of the improvements.

*Figure 10* is used to determine the cost factor for each site.

## G. CALCULATE PRIORITY INDEX

The priority index is determined by combining the hazard index and the cost index. The hazard index is given a 75 percent weight and the cost index is weighted 25 percent. These calculations are shown in Chapter IV. The priority index is used to rank each site as shown in the priority listing in Chapter III.

## H. BENEFIT/COST ANALYSIS

The Montana Department of Highways calculates the Benefit/Cost Ratio of safety improvements in order to set priorities for on-system projects. The Benefit/Cost Ratio for each site has been calculated using the MDOH method.

**TABLE 1**  
**SAFETY PROJECT COSTS — APPROVED BY FHWA,**  
**MARCH 6, 1988**

### A. Signs

- 1) 1 square foot to 6 square feet ..... \$100.00
- 2) 6.1 square feet to 10 square feet ..... 140.00
- 3) 10.1 square feet to 20 square feet ..... 170.00

### B. Delineators

- 1) Design "A" metal posts ..... \$ 9.25
- 2) Design "A" flexible posts - 6' ..... 20.00
- 3) Design "A" flexible posts - 27' ..... 6.00

### C. Guardrail

- 1) New "W" beam rail ..... \$8.00 per foot
- 2) "W" beam end treatment incl. anchor ..... 1,000.00 each
- 3) New concrete rail ..... 16.00 per foot
- 4) Concrete end tapers ..... 16.00 per foot

**TABLE 2**  
**RELATIVE SEVERITY INDEX**

TYPE OF ACCIDENT	Urban	Rural
<b>Multi-Vehicle, At Intersection</b>		
Enter at angle .....	\$4,300	\$14,400
From same direction — both going straight.....	2,800	5,100
From same direction — one turn, one straight.....	2,500	5,100
From same direction — one stopped.....	3,800	5,200
From same direction — all others.....	2,000	6,300
From opposite direction — both going straight.....	4,400	20,000
From opposite direction — one left turn, one straight.....	4,400	15,400
From opposite directions — all others.....	2,700	3,800
Not stated .....	3,800	5,200
<b>Multi-Vehicle, Non-Intersection</b>		
Going opposite direction — both moving.....	\$4,400	\$19,600
Going same direction — both moving.....	2,900	8,100
One car parked.....	1,600	2,400
One car stopped in traffic.....	4,200	6,800
One car entering parked position.....	1,900	2,300
One car leaving parked position.....	1,200	2,700
One car entering alley or driveway.....	3,400	6,000
One car leaving alley or driveway.....	2,000	4,400
All others.....	1,700	7,600
Not stated .....	3,400	6,000
<b>Motor Vehicle with Pedestrian, At Intersection and Non-Intersection</b>		
Vehicle going straight .....	\$20,000	\$49,000
Vehicle turning right .....	13,600	11,200
Vehicle turning left .....	17,100	11,200
Vehicle backing .....	20,600	11,200
All others.....	14,500	11,200
Not stated .....	11,200	11,200
<b>Singled Vehicle, at Intersection</b>		
Collision with train .....	\$26,700	\$39,100
Collision with bicycle.....	13,100	31,900
Injury in vehicle, jackknifed.....	5,200	2,000
Collision with fixed object in road .....	5,500	7,000
Overturned in road.....	9,200	7,500
Left road .....	5,200	12,300
<b>Single Vehicle, Non-Intersection</b>		
Collision with train .....	\$26,700	\$39,100
Collision with bicycle.....	13,100	31,900
Injury in vehicle, jackknifed.....	5,200	2,000
Collision with fixed object in road .....	6,300	9,200
Overturned in road.....	10,000	9,400
Left road at curve .....	7,600	12,400
Left road on straight road .....	5,200	10,500
<b>Other One Motor Vehicle, At Intersection and Non-Intersection</b>		
Fell from moving vehicle .....	\$15,000	\$57,200
Collision with animal .....	4,800	1,800
Collision with other object .....	4,700	4,400
All others .....	5,200	2,000
Not stated .....	3,200	3,400

Source: National Safety Council

**Figure 1**  
**DRIVER EXPECTANCY PROBLEMS RATING FORM**

Ratings

0 — Nothing expected or unusual at this location.  
Actions required (if any) entirely consistent with driving strategy on approach.  
Standard geometry, with pathway(s) for intended movement(s) clearly evident.  
No interferences by other traffic likely.

1 —

2 —

3 — Situation somewhat unexpected.

Driver must be alert, but should be able to respond adequately at "last minute" to most combinations of adverse circumstances.  
Some initial confusion on intended path(s) or movement(s).  
Interference from other traffic may create some degree of confusion or uncertainty for average driver.

4 —

5 —

6 — Very unusual situation; will "surprise" many unfamiliar drivers.  
Driver required to make major change in driving tactics from those employed over past few miles.

At least a "near accident" almost expected if driver is even moderately inattentive; evasive actions likely to be required.  
Intended pathway(s) confusing under fairly normal traffic or lighting conditions.

Other traffic, or lack of it, aggravates situation and misleads driver or deprives him of important cues.

Approach

	<u>Rating</u>						
	0	1	2	3	4	5	6
A	x -----	x -----	x -----	x -----	x -----	x -----	x -----
B	x -----	x -----	x -----	x -----	x -----	x -----	x -----
C	x -----	x -----	x -----	x -----	x -----	x -----	x -----
D	x -----	x -----	x -----	x -----	x -----	x -----	x -----

Source: Identification of Hazardous Locations, Report No. FHWA-RD-77-83

**Figure 2**  
**INFORMATION SYSTEM DEFICIENCIES RATING FORM**

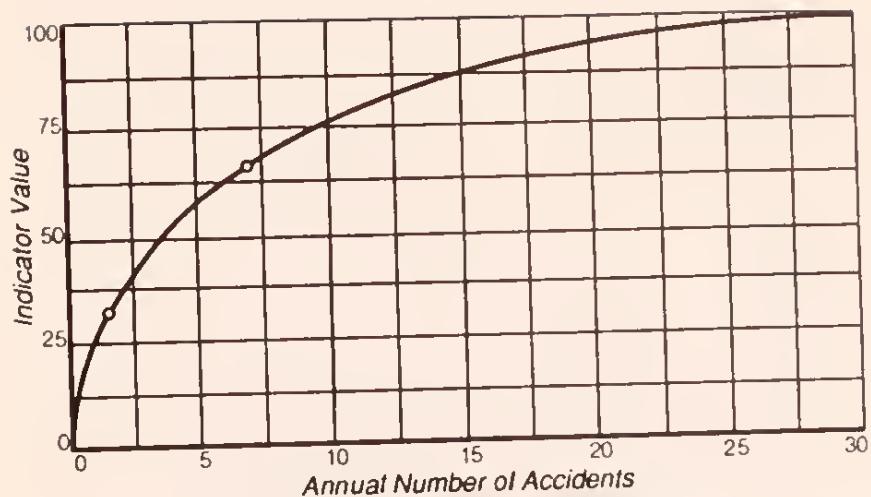
Ratings

- 0 — Information for required decisions complete and ambiguous.  
Signs, markings, delineation in good repair, clean, highly visible.  
"Positive guidance" leads driver to appropriate path; makes error difficult.  
Approach speeds of most drivers are appropriate.  
Light decision load; easy, and obvious.
- 1 —
- 2 —
- 3 — Some information lacking or somewhat misleading.  
Signs should be moved or augmented for better visibility or to provide more decision time.  
Visibility of signs, markings, and delineation barely adequate.  
Advisory speed information should be changed slightly, or added.  
Medium decision load; average driver will be able to handle situation, but may be a little uncomfortable.
- 4 —
- 5 —
- 6 — Important information missing.  
Complete new "information system" needed — design and installation.  
Present signs and marking in very poor condition; need replacement.  
Speed limit and/or advisory speed needed; either missing or totally inappropriate at present.  
"Positive guidance" on appropriate path lacking; a clutter of negative delineation only.  
Heavy decision load; complete attention of average driver required; a "tense" situation at best.

Approach

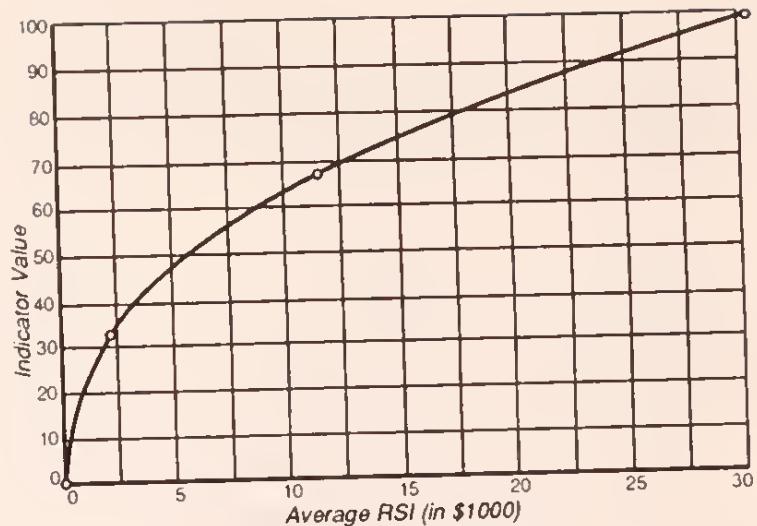
	<u>Rating</u>						
	0	1	2	3	4	5	6
A	x	-----	x	-----	x	-----	x
B	x	-----	x	-----	x	-----	x
C	x	-----	x	-----	x	-----	x
D	x	-----	x	-----	x	-----	x

Source: Identification of Hazardous Locations, Report No. FHWA-RD-77-83



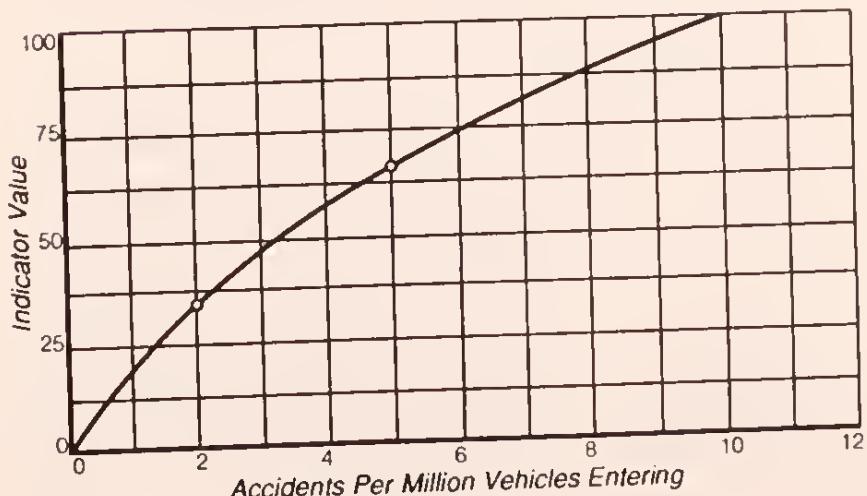
**INDICATOR VALUES FOR NUMBER OF ACCIDENTS**

*Figure 3*



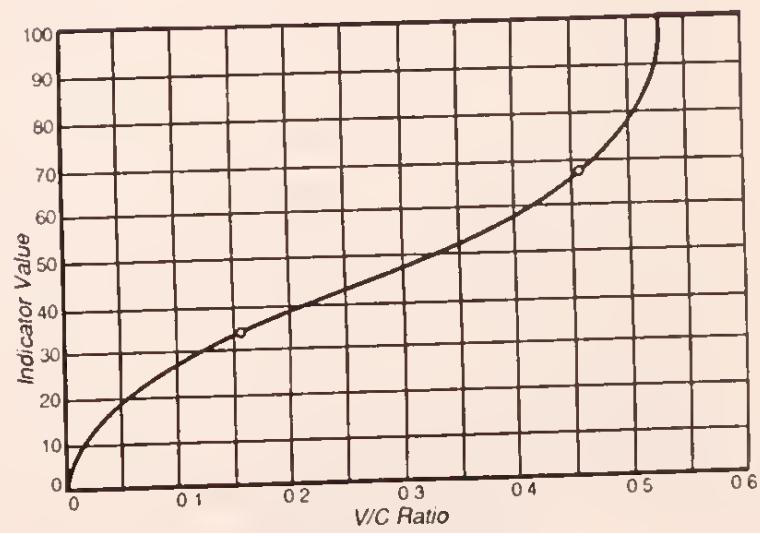
**INDICATOR VALUE FOR ACCIDENT SEVERITY**

*Figure 5*



**INDICATOR VALUES FOR ACCIDENT RATE**

*Figure 4*



**INDICATOR VALUES FOR V/C RATIO**

*Figure 6*

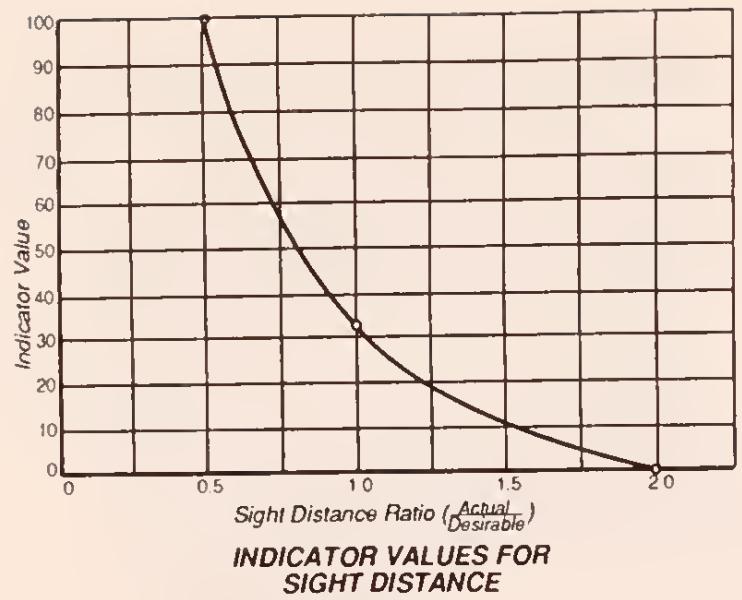


Figure 7

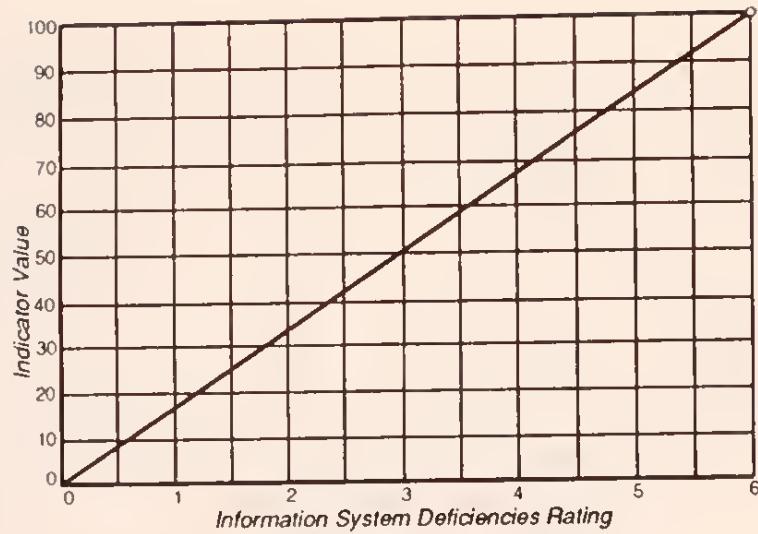


Figure 9

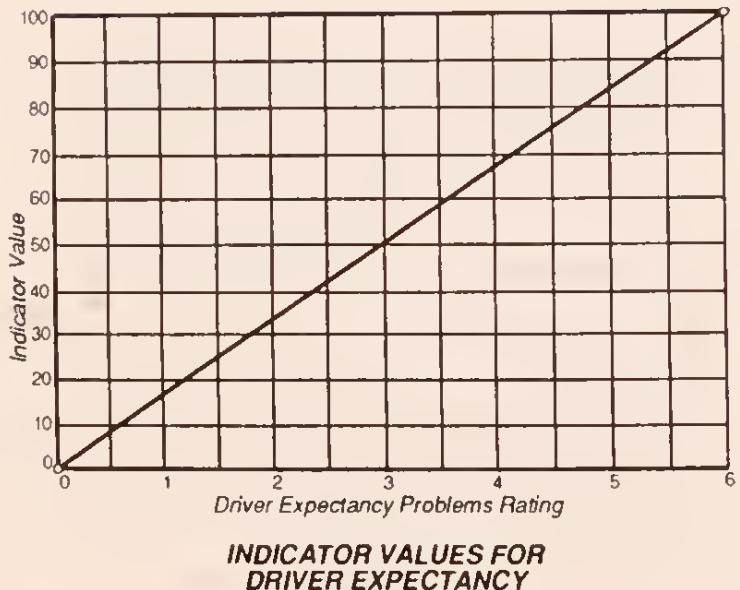


Figure 8

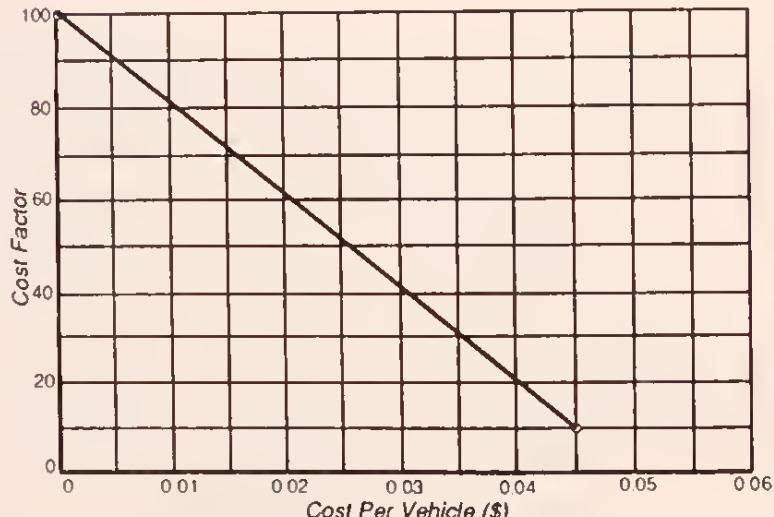


Figure 10

## CHAPTER III. SUMMARY OF RECOMMENDATIONS

### A. IMPROVEMENT PRIORITIES

Table 3 shows the final listing of improvement priorities based on the priority index which takes into account the hazardousness of each site and the cost of recommended improvements. The hazard index is given a 75 percent weight and the cost factor a 25 percent weight.

The Benefit/Cost Ratio calculated using the Montana Department of Highways' method is also shown for each site.

**TABLE 3**  
**IMPROVEMENT PRIORITY LIST**

PRIORITY NO.	SITE NO.	LOCATION	PRIORITY INDEX	HAZARD INDEX	COST	*MDOH COST/BENEFIT
1	10	Roosevelt Dr.—Curve	79.85	73.46	\$900	7.00
2	15	Roosevelt Dr.—Bend	75.71	67.95	\$480	23.36
3	14	Thomas—Kossuth	65.13	53.84	\$520	15.77
4	9	Thomas—Moulton	64.15	52.54	\$320	34.17
5	4	Marcia—Wilson	62.67	50.56	\$320	10.42
6	3	Farragut—Amherst	61.30	48.74	\$1,760	11.10
7	1	Arizona—Mercury	59.36	46.15	\$2,160	19.56
8	13	Sheridan—Floral	59.15	45.87	\$1,660	2.47
9	8	Continental—St. Anns	58.22	44.63	\$920	7.43
10	11	Yale—Hancock	57.29	43.39	\$320	15.20
11	2	Farragut—Cobbin	57.20	43.26	\$2,160	7.05
12	6	Farragut—Grand	56.20	41.94	\$380	11.59
13	7	Farragut—Ottawa	55.72	41.29	\$1,050	3.99
14	12	Farragut—George	55.49	40.99	\$600	3.03
15	17	Sherman—Bayard	54.48	39.65	\$600	4.56
16	16	Farragut—Yale	53.50	38.34	\$920	23.36
17	5	Texas—Grand	53.38	38.17	\$1,060	5.88
TOTAL COST					\$16,130	

*\*Dollars in benefit for each dollar spent—based on Montana Department of Highways benefit/cost method*

### B. IMPLEMENTATION

The priority list should be used to develop an improvement schedule. The highest ranked site should be funded first and as funding becomes available, each site should be improved according to its respective rank.

If funds are not available to complete all improvements, traffic control device installation should be funded first. These are generally the most cost-effective improvements and can be accomplished by the county maintenance crew. Widening, reconstruction or new construc-

tion improvements should be made as funding is available.

State law requires that all traffic control devices installed on the county road system conform to the standards set forth

in the *Manual on Uniform Traffic Control Devices for Streets and Highways* (1988). The manual also specifies installation standards. By using uniform signs and markings and uniform placement, the driver becomes accustomed to

obtaining clear information about the roadway by observing these devices.

*Figure 11* shows the proper method for prohibiting parking at urban intersections. *Figures 12 and 13* show steps to follow in analyzing signal removal.

An exchange of road construction and maintenance methods by counties throughout the state is a valuable source of information that may result in cost savings and statewide uniformity.

**TABLE 4**  
**LIST OF MATERIALS**

ITEM	SIGN NO.	SIZE	QUANTITY	COST*
<b>LIST OF MATERIALS ELIGIBLE FOR MDOH FUNDING</b>				
Stop	R1-1	30" x 30"	1	\$140
4-Way Supplemental Plate	R1-3	12" x 6"	4	\$400
Lane Use Control	R3-8	30" x 30"	2	\$280
No Parking Here to Corner	R7-1L	12" x 18"	38	\$3,800
No Parking Any Time	R7-1	12" x 18"	3	\$300
Turn Right	W1-1R	30" x 30"	1	\$100
Turn Left	W1-1L	30" x 30"	1	\$100
Stop Sign Ahead	W3-1a	36" x 36"	17	\$2,380
Signal Ahead	W3-3	36" x 36"	12	\$1,680
Large Arrow	W1-6	48" x 24"	2	\$280
Double Arrow	W1-7	48" x 24"	1	\$140
Design A flexible delineators		6' length	31	<u>\$620</u>
			<b>Sub Total</b>	<b>\$10,220</b>
<b>IMPROVEMENTS THAT MAY NOT BE ELIGIBLE FOR SAFETY FUNDING</b>				
12" red indication signal lens—24 @ \$150 each				\$3,600
Curb, striping and crosswalk paint				\$1,400
Trim trees and bushes				\$340
Reconstruction—mill high crown				\$400
Paint left turn bay				<u>\$500</u>
			<b>Sub Total</b>	<b><u>\$6,240</u></b>
			<b>TOTAL COST</b>	<b><u>\$16,460</u></b>

\*Based on safety project costs approved by FHWA, 3-6-88

### C. ONGOING PROGRAM

U.S. Bureau of Census local population estimates show that Butte-Silver Bow County population has decreased from 38,092 in 1980 to 33,200 in 1988, a loss of nearly 13 percent. All but two accident sites are located in the urban area north of Interstate 90 and east of Harrison Avenue. Many accidents involved young drivers. During the site survey, many residents commented that Farragut is becoming a popular "drag strip" for young drivers. Six of the 17 sites are located at intersections on Farragut. Most of the recommended improvements on this corridor consist of increasing driver expectancy and providing clearer and more visible information. It is important that an ongoing program for safety improvements be maintained. Our work with the Butte-Silver Bow community development department and the Sheriff's Office was made easier by the way accident

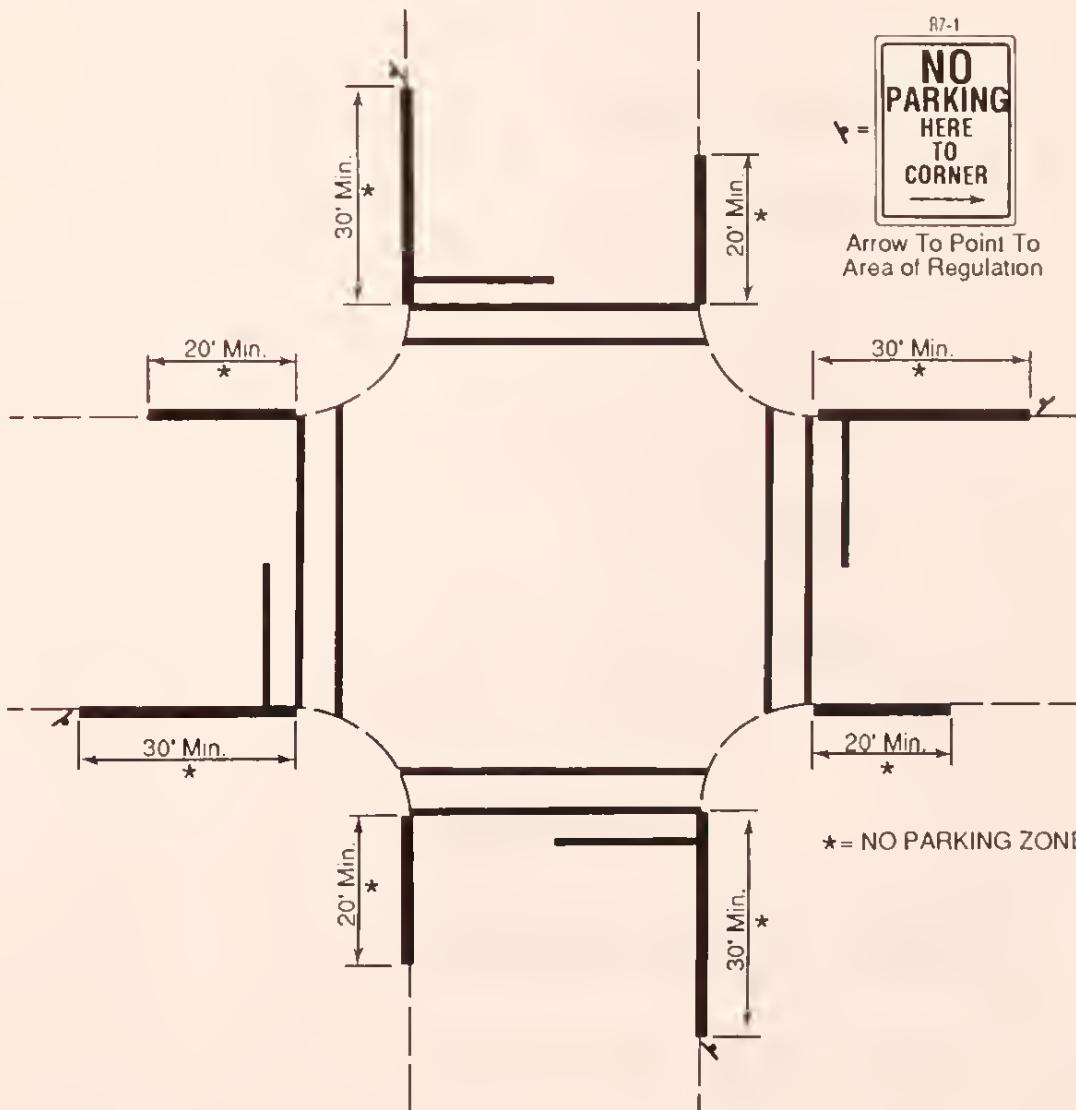
records are organized, maintained and analyzed. The following steps should be taken to continue the ongoing safety improvement program currently in place.

1. Set up safety improvement schedule to implement recommended improvements set forth in this report, in order of priority and as funds become available.
2. Obtain annual plots of accidents occurring on county roads from the Montana Department of Justice, Highway Traffic Safety Division.
3. Use annual accident plots to evaluate effectiveness of safety improvements that have been implemented.
4. Use annual accident plots to determine high accident locations to be included in the ongoing safety improvement program.
5. Obtain detailed accident reports for the selected sites from the Department of Justice.
6. Develop ongoing improvement plan.

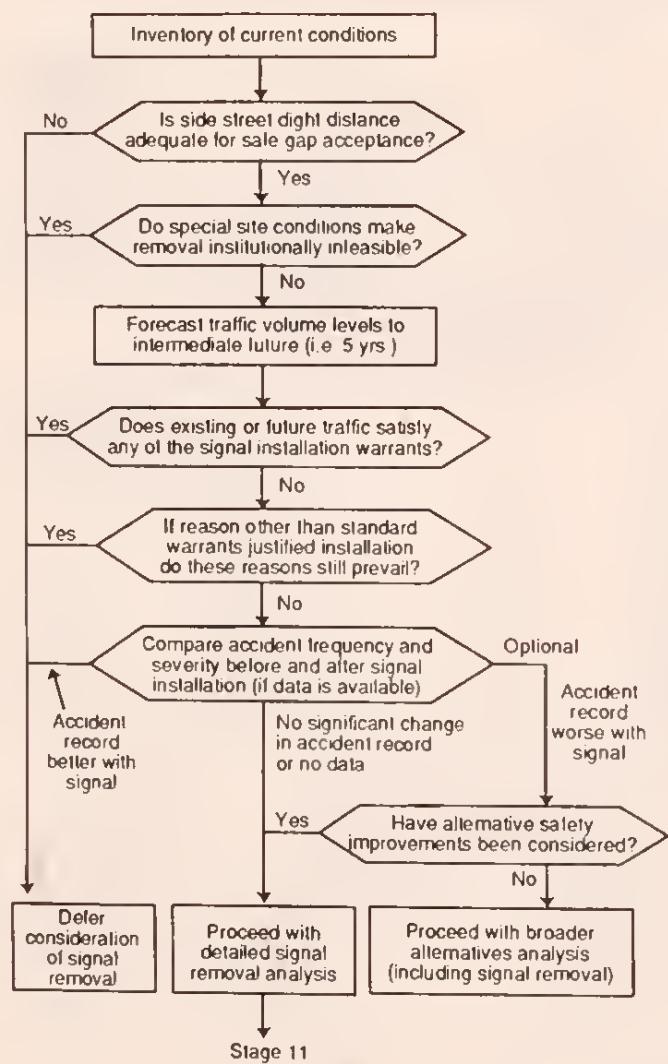
Figure No. 11

### TYPICAL PARKING LAYOUT

#### Signal or STOP Controlled Intersection

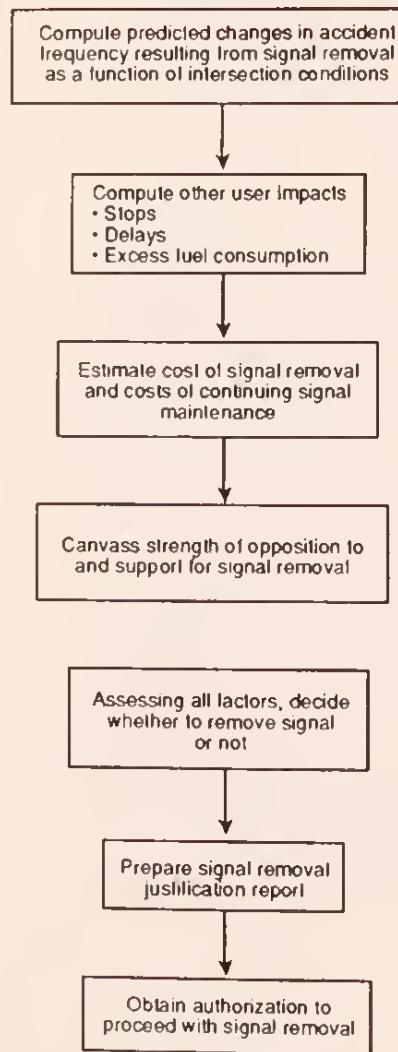


**Figure 12**  
**Signal Removal—Preliminary Screening**



Source *Traffic Control Devices Handbook*, US Dept. of Transportation, FHWA 1983

**Figure 13**  
**Signal Removal—Detailed Analysis**



Source *Traffic Control Devices Handbook*, US Dept. of Transportation, FHWA 1983

## **CHAPTER IV. SITE ANALYSIS**

This chapter presents, in detail, the analysis of each of the sites. The information for each site consists of the following:

1. General location map showing site locations within the county;
2. Photos of the sites;
3. Sketch plan showing existing conditions;
4. Sketch plan showing recommended improvements;
5. Accident summary; and
6. Hazard index and priority index calculations.



# SITE LOCATION MAP

Butte - Silver Bow County, Mt.

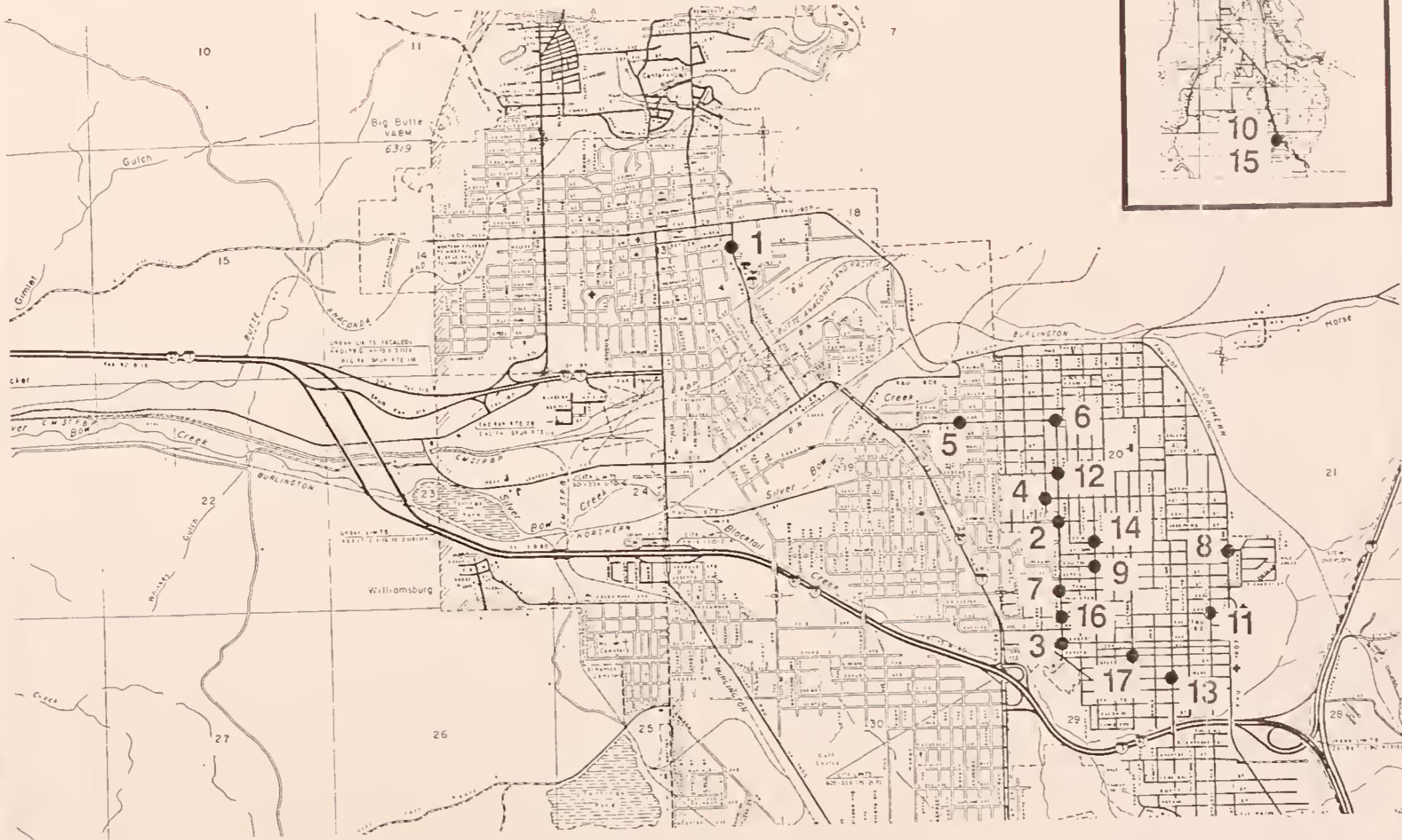


Fig. No.  
1A



SITE NO.1





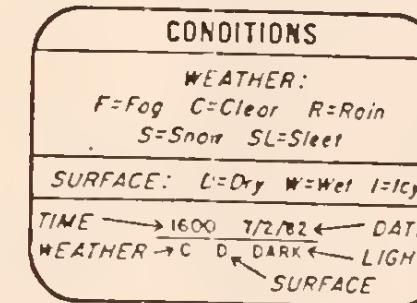
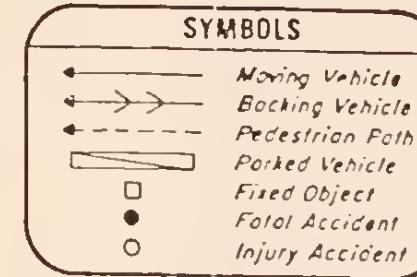
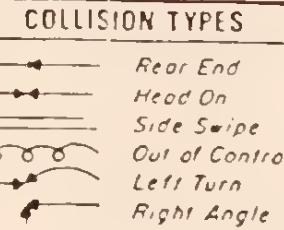
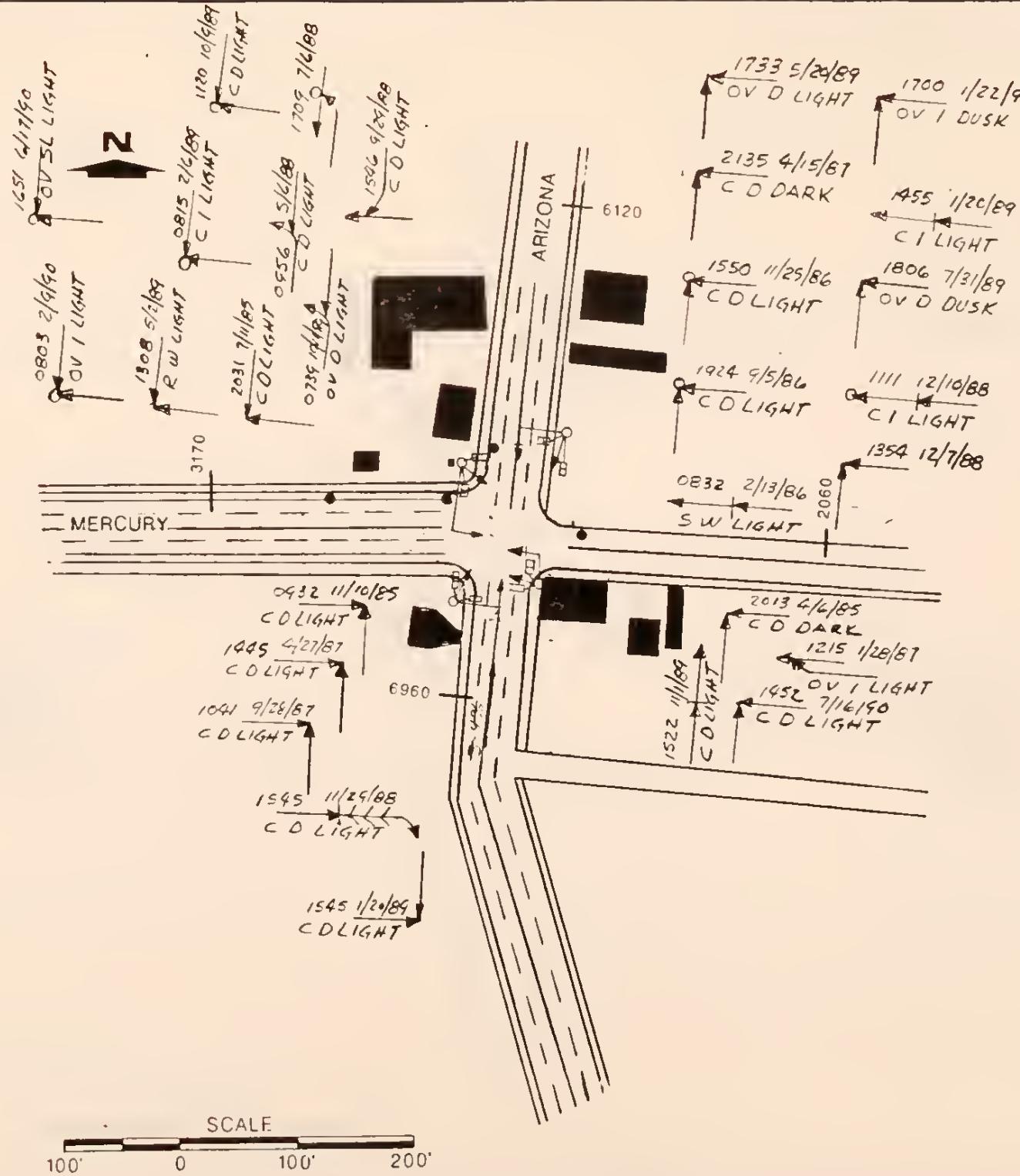


**Site No. 1: Arizona and Mercury.** West leg of the intersection of Arizona and Mercury looking east. Note: two-lane transition on east leg, limited sight distance from east leg south and utility poles in R.O.W.



**Site No. 1: Arizona and Mercury.** North leg of the intersection of Arizona and Mercury looking south. Note: utility poles in R.O.W. and downhill grade from north to south.





## SITE NO. 1 Existing Conditions & Accidents

Butte - Silver Bow County, Mt.

Arizona - Mercury

Fig. No.  
1-1



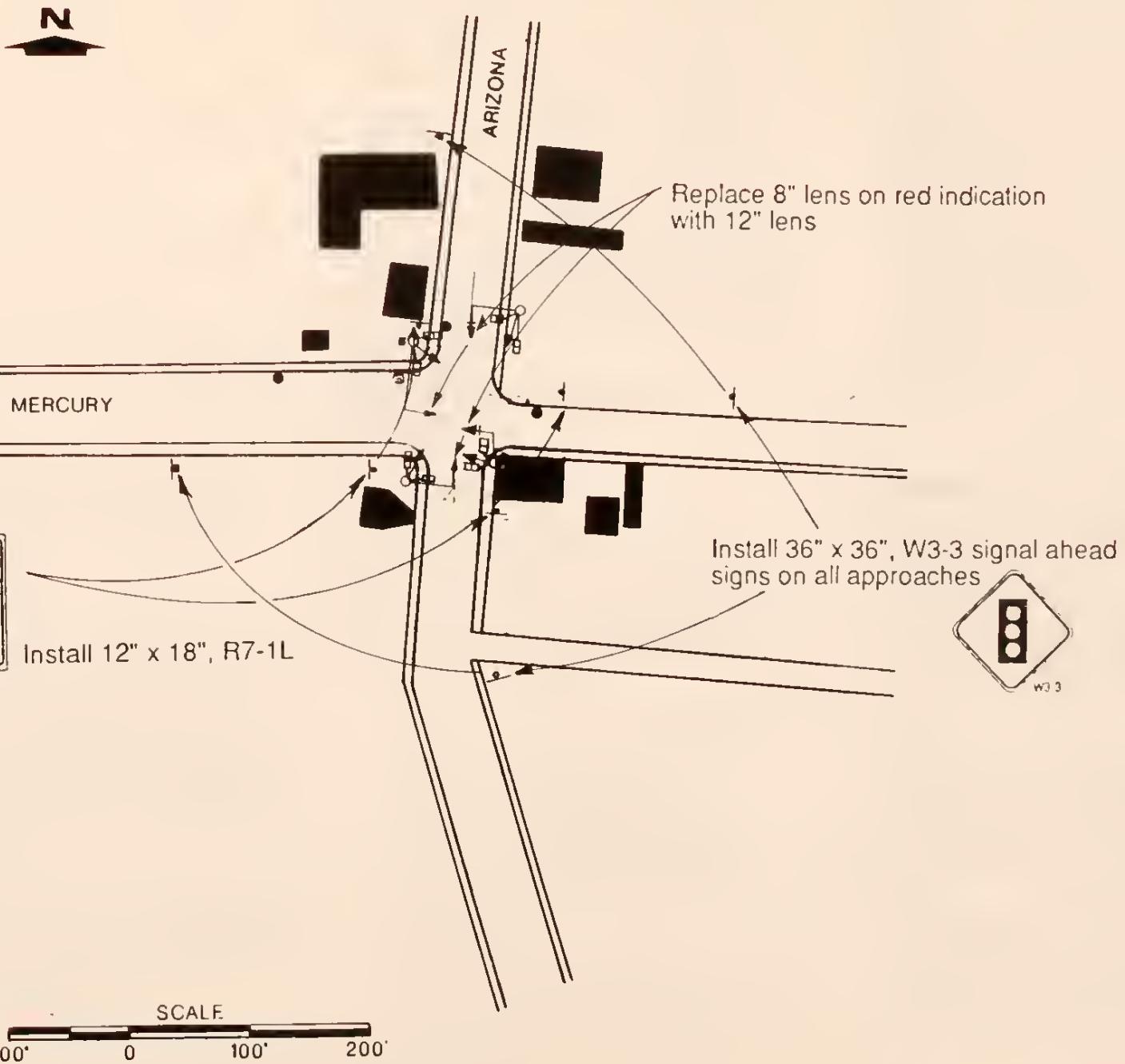
*Recommended Improvements*

Arizona - Mercury

**SITE NO. 1**

Battle-Silver Bow County, Mt.

Fig. No.  
1-2





widened, however, power poles still remain in the parking lanes on the west and north sides of the street.

The 1990 average daily traffic is as follows:

Arizona— north leg ..... 6120 VPD

Arizona— south leg ..... 6960 VPD

Mercury— east leg ..... 2060 VPD

Mercury—west leg ..... 3170 VPD

The intersection is controlled by an isolated, fixed time signal. Each signal cycle is 50 sec. duration with a 3 sec. amber clearance interval.

The existing site characteristics are shown on *Figure 1—1*.

## SITE 1

### INTERSECTION OF ARIZONA AND MERCURY

#### A. Description

This intersection is located in the southeastern corner of the Butte uptown area. Arizona is the major access street from the Harrison Avenue interchange on I-90 to the uptown area. There is a 3–4% uphill grade from north to south through the intersection. The east–west approaches are relatively level.

Mercury is a four-lane street on the west side of the intersection, narrowing to two lanes on the east leg. Arizona is a four-lane street with no parking.

In the past, the intersection has been

- Twenty (67 percent) of the accidents were on a dry surface, 23 percent on ice and 10 percent on wet or snowy streets.
- Twenty-five (83 percent) of the accidents were angle collisions.
- Fourteen (47 percent) of the accidents were the result of failure to yield R.O.W.
- Seven (23 percent) of the accidents involved injuries.
- Alcohol was involved in two of the accidents.

Accident diagrams are shown on *Figure 1—1*.

#### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. The high incidence of failure to yield accidents indicates a visibility problem, especially for southbound vehicles on Arizona.
2. Eighty-seven percent of the accidents occurred during the daytime with forty percent occurring during the afternoon peak. This indicates a daytime visibility problem.
3. The isolated nature of this signal results in a low degree of driver expectation.
4. Road conditions were not determined to be a major accident cause.

#### **D. Recommended Improvements**

The following improvements are recommended for this site:

1. Replace 8" lens on red indication with 12" lens on all approaches — 8 lenses @ \$150 each .....\$1200.
2. Install 4—36" x 36", W3-3, signal ahead signs 150 feet in advance of the north, south, east and west approaches ..\$560.
3. Install 12" x 18", R1-7L, "No Parking Here to Corner" signs on all approaches and paint curbs as shown on Figure 11. ....\$400

Total Cost .....\$2160

**Long Range**—Average daily traffic counts and supplemental peak hour traffic counts at this location indicate that the approach volume signal warrants may not be met. It is beyond the scope of this project to carry out a comprehensive signal removal analysis. An outline of the steps that should be taken to determine if a signal should be removed is shown in *Figures 12 and 13*.

Based on the preliminary screening process (*Figure 12*), the limited side street sight distance on the east leg would defer consideration of signal removal at this location.

Following implementation of the short term improvements, accident records should be monitored to determine if the increased signal visibility and driver information results in a reduction of vehicles failing to stop for the signal, the major

accident cause. If accidents are not reduced, it is recommended that new mast arms be installed on the east and west approaches so that signal heads are more nearly aligned over the lanes of the approach.

Recommended improvements are shown on *Figure 1—2*.

#### **E. Hazard and Priority Indices**

Based on the information collected and the foregoing analysis, the hazard index for this site is 46.15 and the priority index is 59.36.

SITE NO.2  
•••••••••••••





**Site No. 2: Farragut and Cobbin.** South leg of the intersection of Farragut and Cobbin looking north.



**Site No. 2: Farragut and Cobbin.** East leg of the intersection of Farragut and Cobbin looking west. Note: curb cuts.



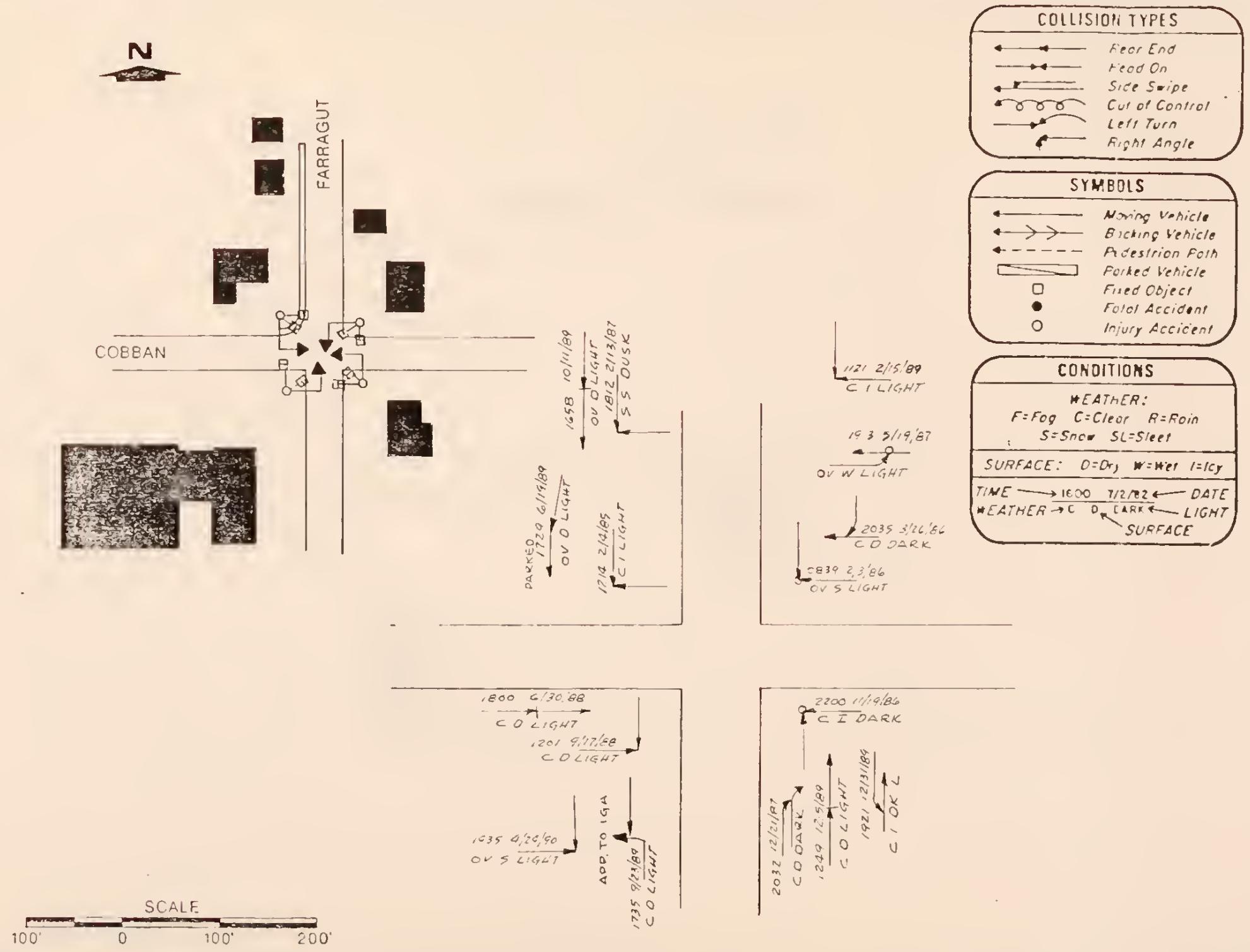


Fig. No.  
2—1

SITE NO. 2

*Butte-Silver Bow County, Mt.*

*Existing Conditions and Accidents*

Cobban - Farragut



**SITE NO. 2 Recommended Improvements**

Battle-Silver Bow County, Mt.

Cobban - Farragut

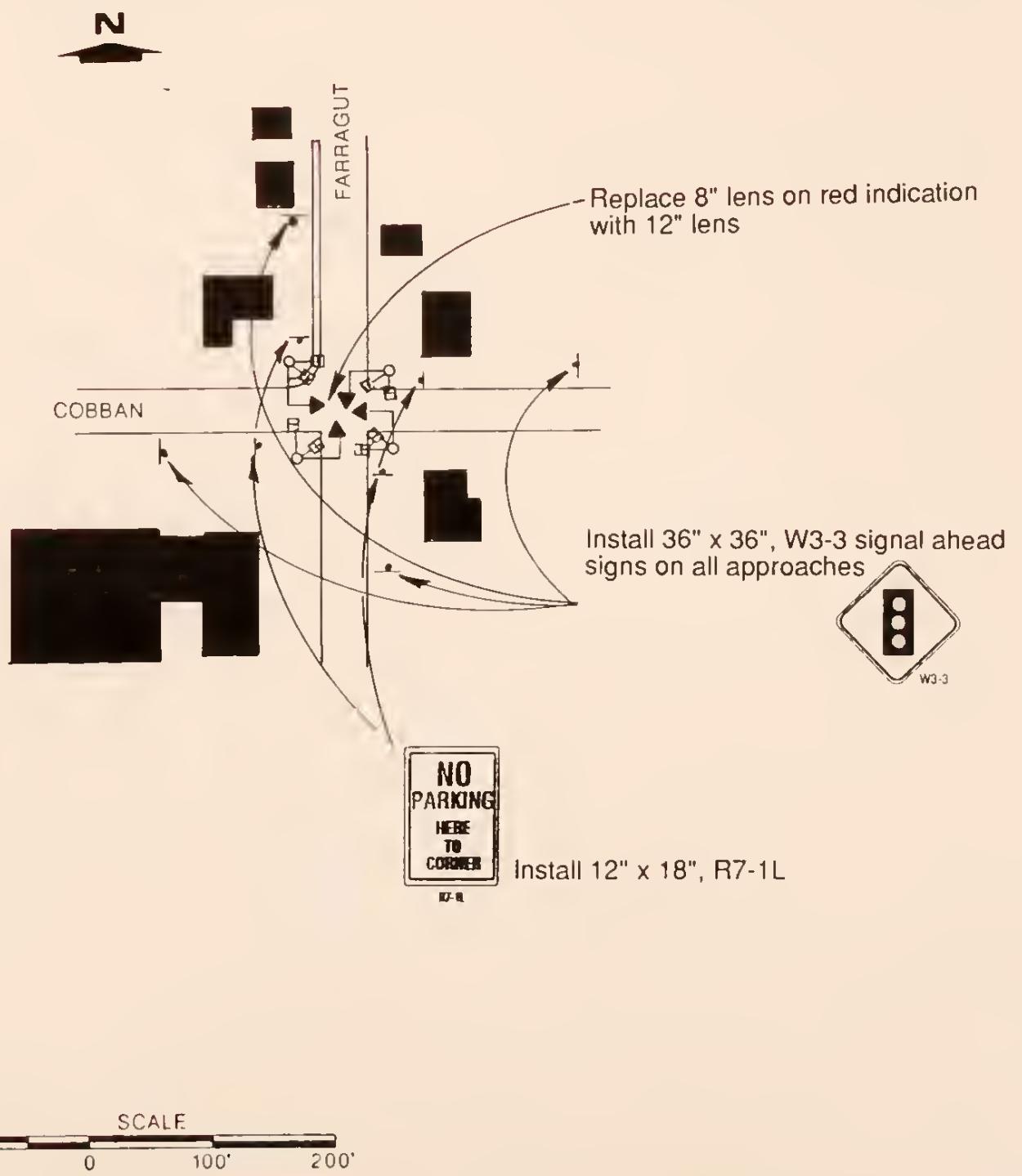


Fig. No.  
2-2



and convenient market on the northwest corner. There are numerous curb cuts near the intersection.

The intersection is controlled by an isolated, fixed time signal. The signal has a 50-second cycle with a 3-second amber clearance interval.

The 1990 average daily traffic is as follows:

Farragut — north leg .....	4550 VPD
Farragut — south leg .....	4600 VPD
Cobban — east leg .....	2400 VPD
Cobban — west leg .....	2650 VPD

Existing conditions are shown on *Figure 2—1*.

## SITE 2

### INTERSECTION OF FARRAGUT AVENUE AND COBBAN STREET

#### A. Description

This site is a 4-legged intersection located in the northeast sector of Butte. Farragut is a collector street providing a continuous through street from Bayard to Grand. Major intersections are controlled by traffic signals. Cobban is an east-west collector and is one of the few collector streets that is continuous from Continental Drive, across Harrison to Kaw Avenue. The surrounding land use is generally neighborhood commercial. There is a small bakery and St. Anns Church on the southeast corner, a neighborhood shopping center on the southwest corner and a cleaners

#### B. Accident Analysis

Sixteen accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- Seven (44 percent) of the accidents occurred in 1989 and the first quarter of 1990.
- Fourteen (87 percent) of the accidents occurred on weekdays.
- Seven (44 percent) of the accidents occurred during the winter.
- Twelve (75 percent) of the accidents occurred during daylight hours.

- Seven (44 percent) of the accidents occurred on a snowpacked or icy street.

- Driver related contributing factors were as follows

#### Failure to yield

R.O.W. ....	44 percent
Speed .....	25 percent
Improper turn .....	12 percent
Other .....	19 percent

- There were no fatality or injury accidents at this site.

Accident diagrams are shown on *Figure 2—1*.

#### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. The major cause of accidents at this site is vehicles running the red signal indication. This is typical of other isolated signals on Farragut. Corrective measures are: increasing signal visibility and providing information in advance of the intersection.

#### D. Recommended Improvements

The following improvements are recommended for this site:

1. Replace 8" lens on red indication with 12" lens on all approaches. .... \$1200

2. Install 4—36" x 36", W3-3, signal ahead signs 150ft. in advance of the north, south, east and west approaches. ....	\$560
3. Install 12" x 18", R7-1L, "No Parking Here to Corner" signs on all approaches and paint curbs as shown in <i>Figure 11</i> . (Note: install 30' in advance of curb cuts at intersection.) .....	<u>\$400</u>
Total Cost .....	\$2160

Long Range—Average daily traffic counts and supplemental peak hour traffic counts at this location indicate that the approach volume signal warrants may not be met. A comprehensive signal removal analysis should be made at this location following the steps shown in *Figures 12 and 13*.

The recommended improvements are shown on *Figure 2—2*.

#### **E. Hazard and Priority Indices**

Based on the information collected and the foregoing analysis, the hazard index for this site is 67.95 and the priority index is 75.71.

SITE NO.3







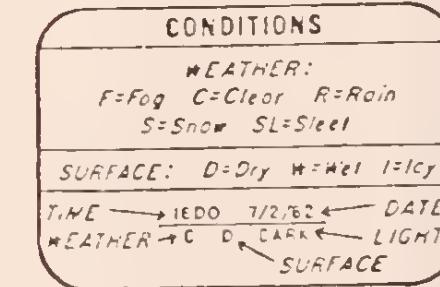
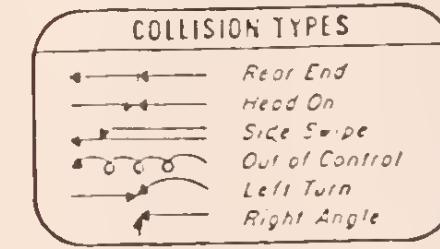
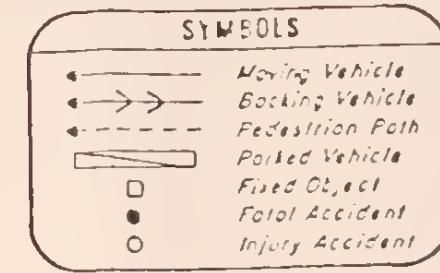
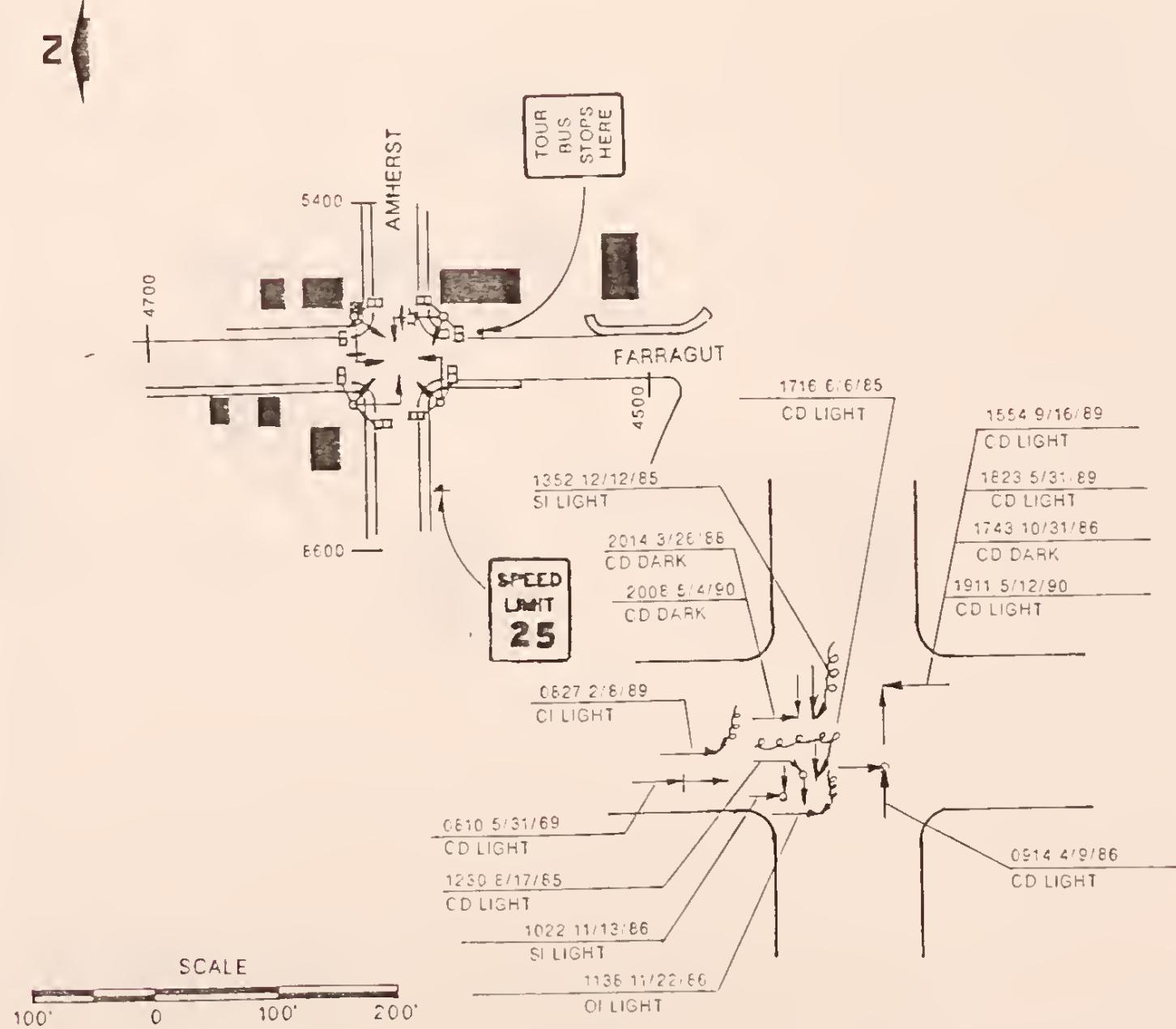
**Site No. 3: Farragut and Amherst.** South leg of the intersection of Farragut and Amherst looking north.



**Site No. 3: Farragut and Amherst.** East leg of the intersection of Farragut and Amherst looking west. Note: A and W on southwest corner, a heavy traffic generator.



### SITE NO. 3 Existing Conditions & Accidents





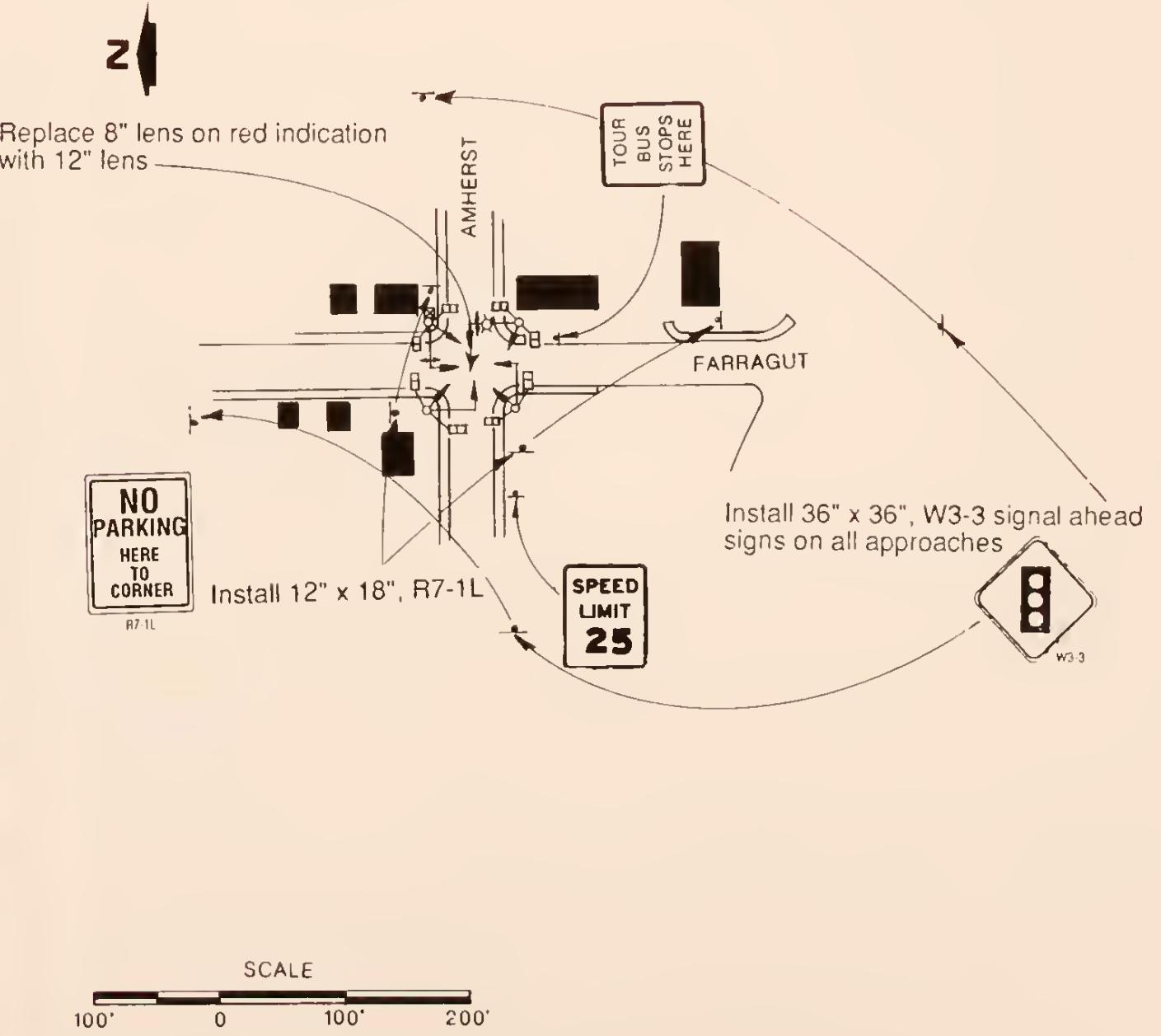
**SITE NO. 3****Recommended Improvements**

Fig. No.

3-2



heavy traffic generator.

The 1990 average daily traffic is as follows:

Farragut — north leg .... 4700 VPD

Farragut — south leg .... 4500 VPD

Amherst — east leg ..... 5400 VPD

Amherst — west leg ..... 8600 VPD

The intersection is controlled by an isolated, fixed time traffic signal. The signal cycle time is 50 sec. with a 3 sec. amber clearance interval.

The existing site characteristics are shown on *Figure 3—1*.

### B. Accident Analysis

Fourteen accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes:

- Six (43 percent) of the accidents occurred in 1989.
- Five (36 percent) of the accidents occurred during the weekend.
- The month of May had the highest number of accidents (29 percent) with the remainder of the accidents distributed evenly over the remaining months.
- All accidents occurred between 8 A.M. and 8 P.M.

- Eleven (79 percent) of the accidents occurred during daylight hours.
- Ten (71 percent) of the accidents occurred during dry and clear roadway and weather conditions.
- Twelve (86 percent) of the accidents were angle collisions.
- Five (36 percent) of the accidents were caused by failure to yield R.O.W.
- Two (14 percent) of the accidents resulted in injuries.
- Alcohol was involved in one accident.

Accident diagrams are shown on *Figure 3—1*.

### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. Detailed analysis of the officer's reports showed that the following reasons were stated by some of the drivers involved:
  - sun glare obscuring signal indication
  - icy conditions (4 accidents)
  - traffic signal out-of-order
  - traffic signal in flashing mode
  - both drivers claimed signal was green
2. Most accidents occurred during daylight hours indicating daylight visibility may be a problem.
3. The intersection is an isolated signal with the nearest signal located on Harrison Avenue, two blocks away.

## SITE 3

### INTERSECTION OF FARRAGUT AND AMHERST

#### A. Description

This site is located three blocks east of Harrison Avenue and one block north of the Harrison Avenue/I-90 interchange. Both streets are classified as minor arterials. Traffic on the streets is generated by the surrounding residential neighborhoods east of Harrison Avenue and north of I-90 and scattered commercial developments along the two arterials. Both streets are two-lane, two-way streets with parking on both sides. There are numerous curb cuts and uncontrolled access adjacent to the intersection. The A & W Drive-In on the southwest corner of the intersection is a

#### **D. Recommended Improvements**

The following improvements are recommended for this site:

1. Replace 8" lens or red indication with 12" lens on all approaches — 8 lenses @ \$150 .....\$1200
2. Install 4—36"x36", W3-3, signal ahead signs, 150 ft. in advance of the north, south, east and west approaches. ..\$560
3. Install 12" x 18", R7-1L, "No Parking Here to Corner" signs on all approaches and paint curbs as shown in *Figure 11*.  
(Note: install 30' in advance of curb cuts at intersection.) .....\$400

Total Cost .....\$2160

Long Range—Average daily traffic counts and supplemental peak hour traffic counts at this location indicate that the approach volume signal warrants may not be met. A comprehensive signal removal analysis should be made at this location following the steps shown in *Figures 12 and 13*.

The recommended improvements are shown on *Figure 3—2*.

#### **E. Hazard and Priority Indices**

Based on the information collected and the foregoing analysis, the hazard index for this site is 48.52 and the priority index is 61.30.

SITE NO.4







**Site No. 4: Marcia and Wilson.** West leg of the intersection of Marcia and Wilson looking east.



**Site No. 4: Marcia and Wilson.** East leg of the intersection of Marcia and Wilson looking west.

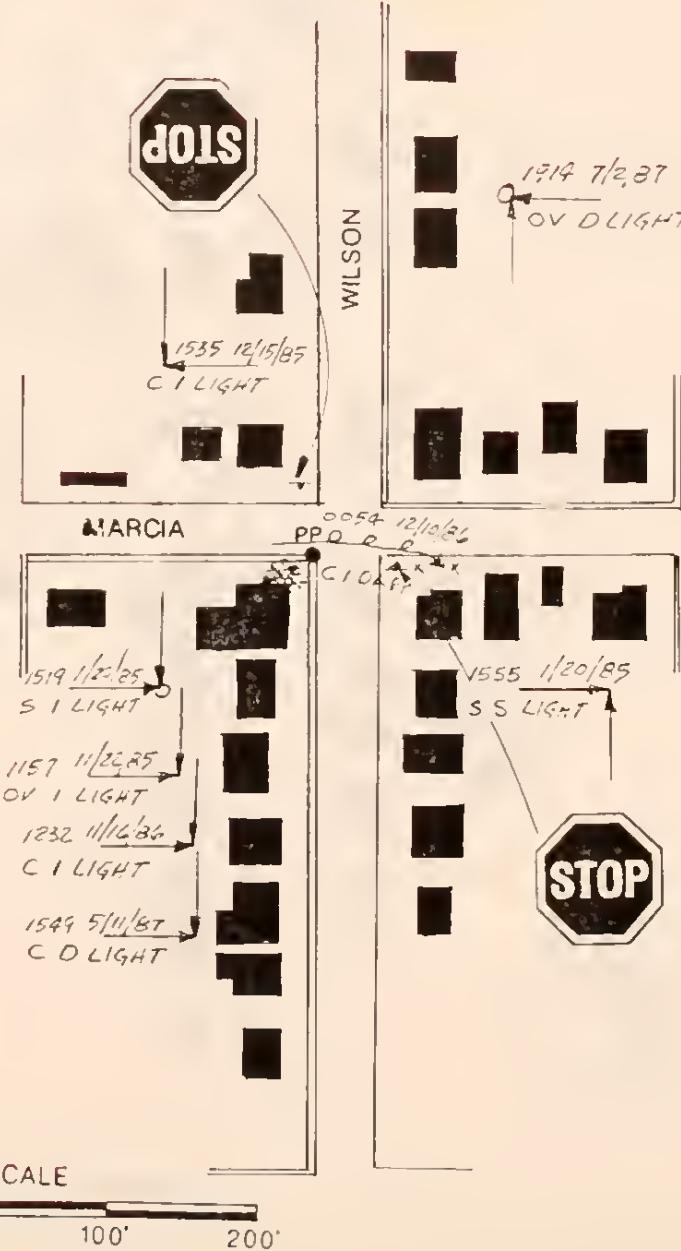


**Existing Conditions and Accidents**

Butte-Silver Bow County, Mt.

**SITE NO. 4**Fig. No.  
4-1

Z

**SYMBOLS**

- Moving Vehicle
- Backing Vehicle
- ↔ Pedestrian Path
- Parked Vehicle
- Fixed Object
- Fatal Accident
- Injury Accident

**COLLISION TYPES**

- Rear End
- Head On
- ↔ Side Swipe
- Out of Control
- Left Turn
- Right Angle

**CONDITIONS**

WEATHER:  
F=Fog C=Clear R=Rain  
S=Snow SL=Sleet

SURFACE: D=Dry W=Wet I=Icy

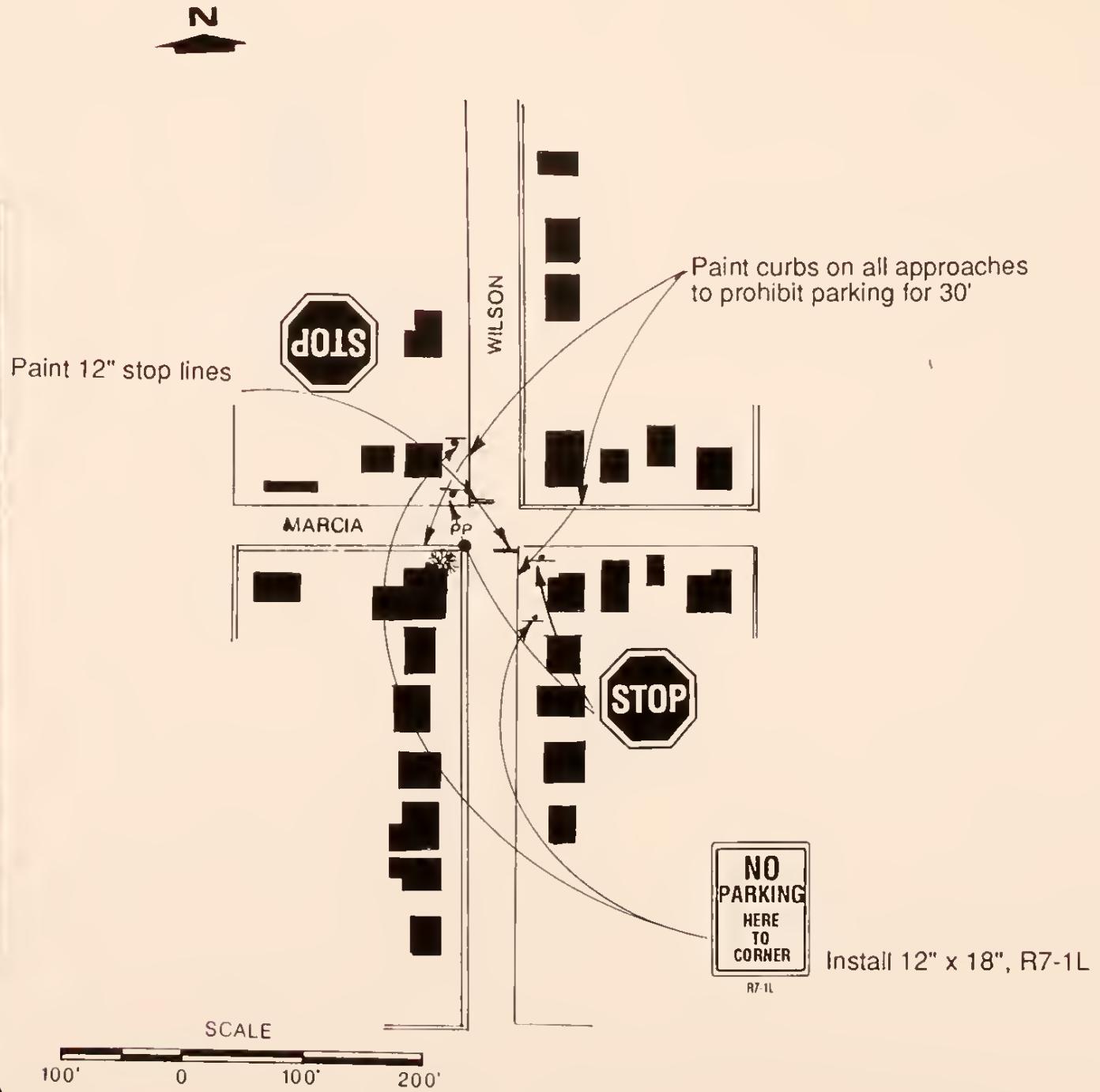
TIME → 1600 DATE ←  
WEATHER → C D DARK ← LIGHT  
SURFACE



**Recommended Improvements****SITE NO. 4**

Butte-Silver Bow County, Mt.

Fig. No.  
4-2





## SITE 4

### INTERSECTION OF MARCIA STREET AND WILSON AVENUE

#### A. Description

This site is a 4-legged intersection located in the northeast residential area of Butte. Both streets are two-lane residential streets with parking both sides. There is a neighborhood shopping center one block south where Wilson forms a "T" intersection with Cobban. The intersection is controlled by stop signs on the north and south legs of the intersection.

The 1990 average daily traffic is as follows:

Wilson — north leg .....	700 VPD
Wilson — south leg .....	850 VPD
Marcia — east leg .....	550 VPD
Marcia — west leg .....	600 VPD

A diagram of present conditions is shown on *Figure 4—1*.

#### B. Accident Analysis

Eight accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- All accidents occurred during the three year period from 1985 through 1987.
- The accidents occurred throughout the week.
- There was no seasonal pattern to the accidents.
- Seven (88 percent) of the accidents occurred between the hours of 11:00 a.m. and 7:00 p.m.
- Six (75 percent) of the accidents occurred on icy or snowpacked streets.
- Seven (88 percent) of the accidents were angle collisions.
- Failure to yield right-of-way and speed were the major accident causes.
- Alcohol was involved in one accident.

A diagram of accidents is shown on *Figure 4—1*.

#### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. The major problem at this intersection was failure to yield right-of-way. Based on the accident report description of the intersection, the intersection was uncontrolled until the summer of 1987 when the last accident was reported. Evidently, STOP signs were installed on Wilson Avenue at that time and no accidents have occurred since. This minor improvement has been effective in alleviating the problem at this intersection. Stop lines on the east and west approaches would increase driver awareness of the stop signs.

#### D. Recommended Improvements

The following improvements are recommended for this site:

- |  |              |
|--|--------------|
| 1. Paint 12" stop lines on the east and west approaches ( <i>See Figure 11</i> ) .....   | \$40         |
| 2. Paint curb to prohibit parking for 30 feet on all approaches .....  | \$80         |
| 3. Install 12" x 18", R7-1L, "No Parking Here to Corner" signs on all approaches. (Note: install 30' in advance of curb cuts at intersection. <i>See Figure 11</i> ) ..... | <u>\$200</u> |
| Total Cost .....   | \$320        |

A diagram of recommended improvements is shown on *Figure 4—2*.

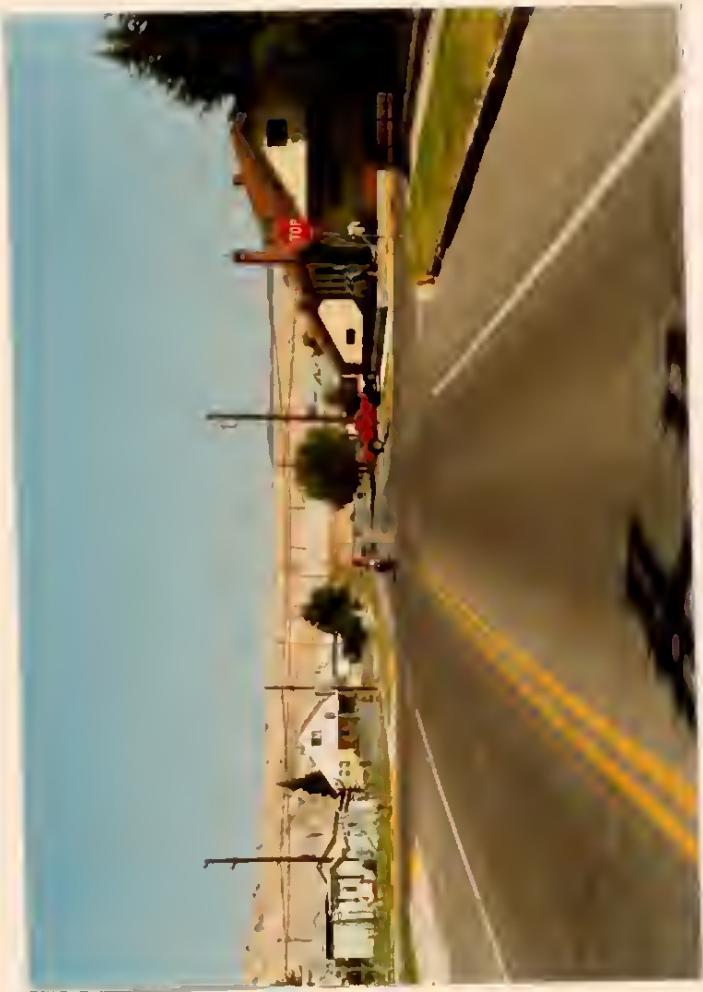
## **. Hazard and Priority Indices**

Based on the information collected and the foregoing analysis, the hazard index for this site is 52.54 and the priority index 64.15.

SITE NO.5





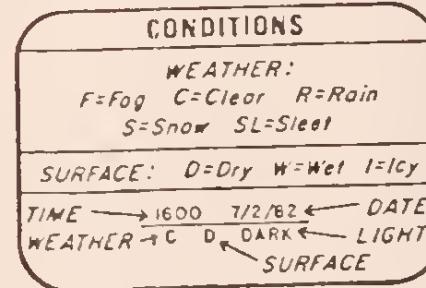
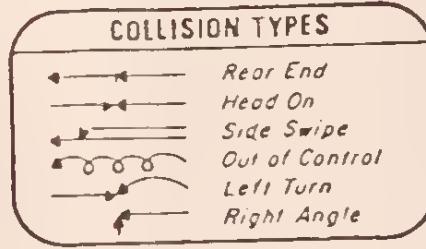
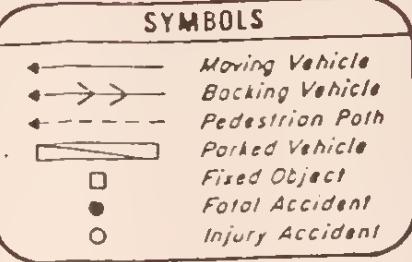
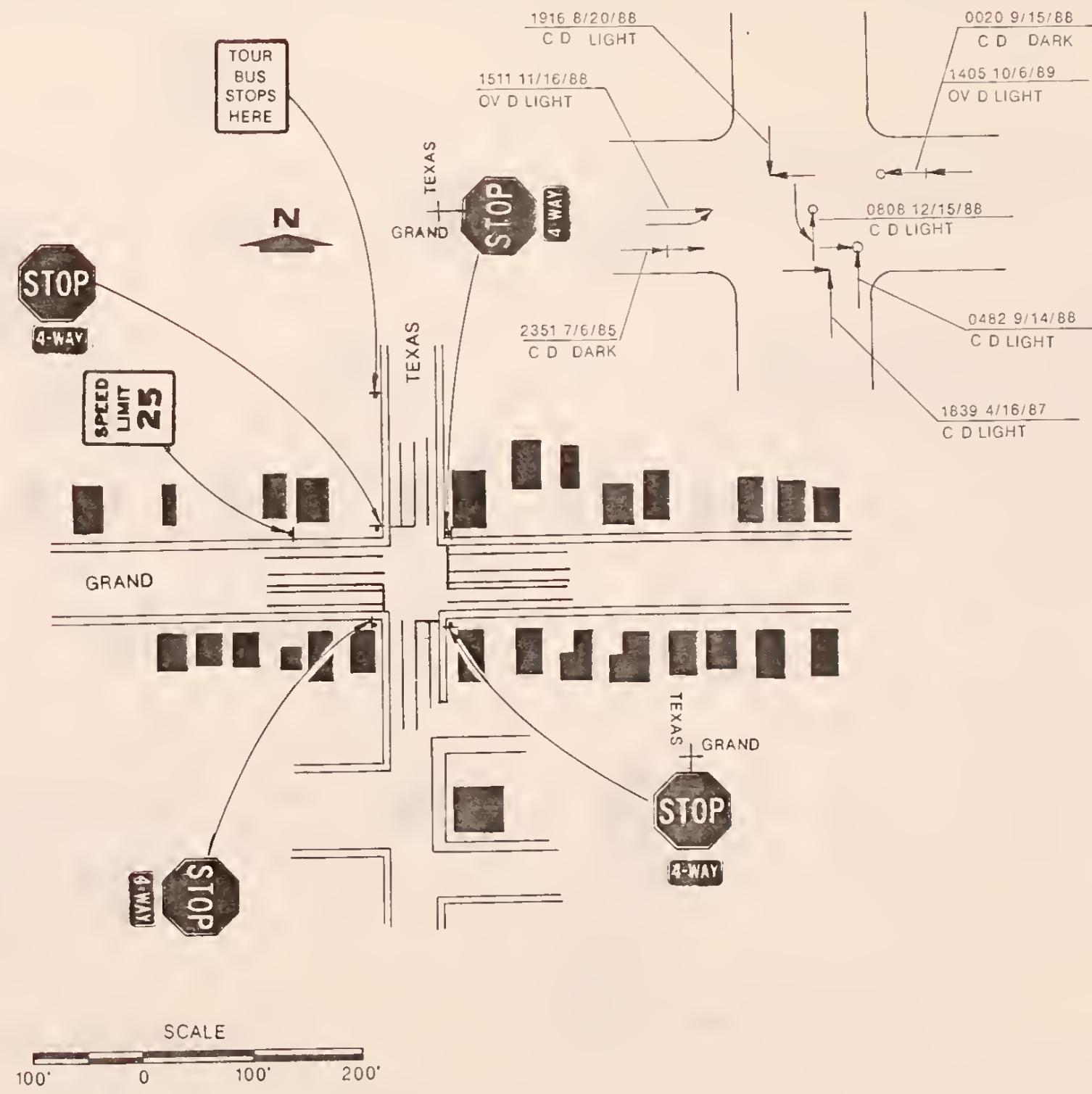


**Site No. 5: Texas and Grand.** South leg of the intersection of Texas and Grand looking north.



**Site No. 5: Texas and Grand.** East leg of the intersection of Texas and Grand looking west.





**SITE NO. 5 Existing Conditions & Accidents**

Butte-Silver Bow County, Mt.

Texas - Grand

**Fig. No.**  
**5-1**

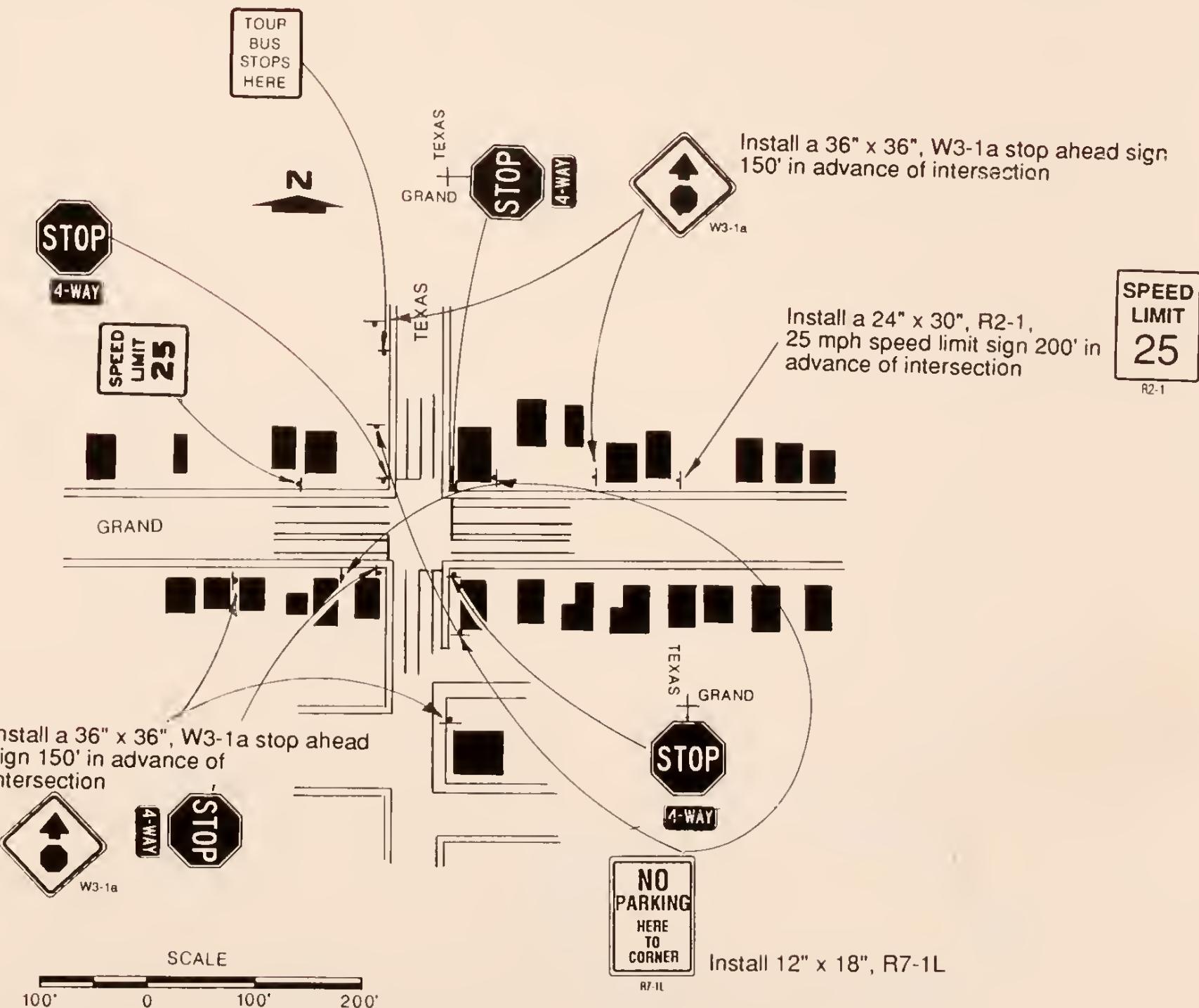


## Recommended Improvements

Texas - Grand

**SITE NO. 5**  
Butte-Silver Bow County, Mt.

Fig. No.  
**5—2**





## **SITE 5**

### **INTERSECTION OF TEXAS AND GRAND AVENUES**

#### **A. Description**

This site is located southeast of the Butte uptown district at a four-legged intersection of Texas and Grand Avenues. Grand is classified as a collector street and Texas a local street. The surrounding land use is single family residential.

Texas is a 2-lane paved street with parking both sides. Grand is a 2-lane paved street, parking both sides, with left turn bays at cross streets. The intersection is controlled by a 4-way STOP. A 25 mph speed limit sign is located on the north side of the west leg of the intersection.

The 1990 average daily traffic is as follows:

Texas—north leg .....	2000 VPD
Texas—south leg .....	2200 VPD
Grand—east leg .....	2550 VPD
Grand—west leg .....	2600 VPD

The 4-way STOP appears to work well because of the similar volumes on all legs of the intersection.

The existing conditions are shown on *Figure 5—1*.

#### **B. Accident Analysis**

Eight accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- Six (75 percent) of the accidents occurred in 1988 and 1989.
- Six (75 percent) of the accidents occurred on weekdays.
- There was no seasonal pattern to the accidents.
- Seven (88 percent) of the accidents occurred between the hours of 8:00 a.m and 8:00 p.m.
- Six (75 percent) of the accidents occurred during daylight hours.
- All accidents occurred on a dry roadway.
- The accidents involved the following

collision types:

angle .....	5
rear-end .....	2
sideswipe .....	1

- Five (62 percent) of the accidents were attributed to failure to yield right-of-way.
- Alcohol was involved in one accident.
- All accidents resulted in property damage only.

A diagram of the accidents is shown on *Figure 5—1*.

#### **C. Evaluation**

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. The 4-way STOP at this intersection is an isolated STOP on both streets which are basically through streets on each side of the intersections. Drivers need to be made aware of the upcoming STOP.
2. All three rear-end accidents occurred on Grand Avenue. Two involved westbound vehicles. Westbound traffic approaches the intersection at higher speeds than on other legs because Grand Avenue is a wide, through street east of the intersection. One westbound vehicle left 67 feet of skid marks before striking the vehicle stopped on the east leg, a motorcycle. This indicates a lack of awareness of

the upcoming STOP sign. A STOP ahead sign on this approach would give additional information to westbound drivers.

3. The angle collisions were vehicles running the STOP sign. This would also indicate a need for warning drivers of the upcoming 4-way STOP.

4. The 25 mph speed limit sign is located within the old Butte city limits. This sign would be more effective east of the intersection.

#### E. Hazard and Priority Indices

Based on the information collected and the foregoing analysis, the hazard index for this site is 50.56 and the priority index is 62.67.

#### D. Recommended Improvements

The following improvements are recommended for this site:

1. Install a 24" x 30", R2-1, 25 mph speed limit sign 200' east of the intersection. ....	\$100
2. Install a 36" x 36", W3-1a STOP Ahead sign on the north, south, east and west approaches. ....	\$560
3. Install 12" x 18", R7-1L, "No Parking Here to Corner" signs on all approaches and paint curbs as shown in <i>Figure 11</i> . (Note: install 30' in advance of curb cuts at intersection.) ....	<u>\$400</u>
Total Cost .....	\$1060

The recommended improvements are shown on *Figure 5—2*.

SITE NO.6





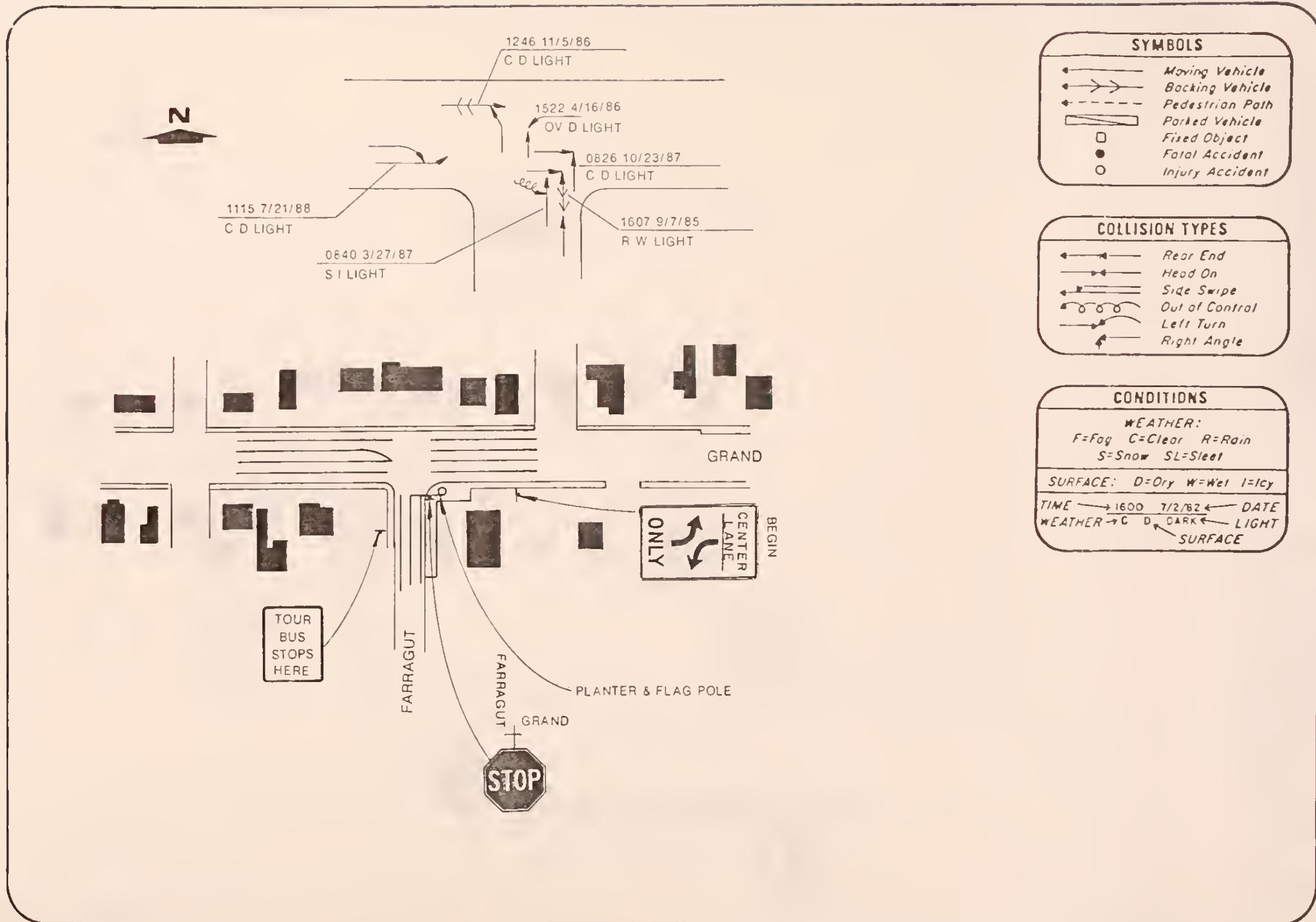


**Site No. 6: Farragut and Grand.** South leg of the intersection of Farragut and Grand looking north.



**Site No. 6: Farragut and Grand.** West leg of the intersection of Farragut and Grand looking east.





## SITE NO. 6 Existing Conditions & Accidents

Butte—Silver Bow County, Mt.  
Grand - Farragut

Fig. No.  
6-1



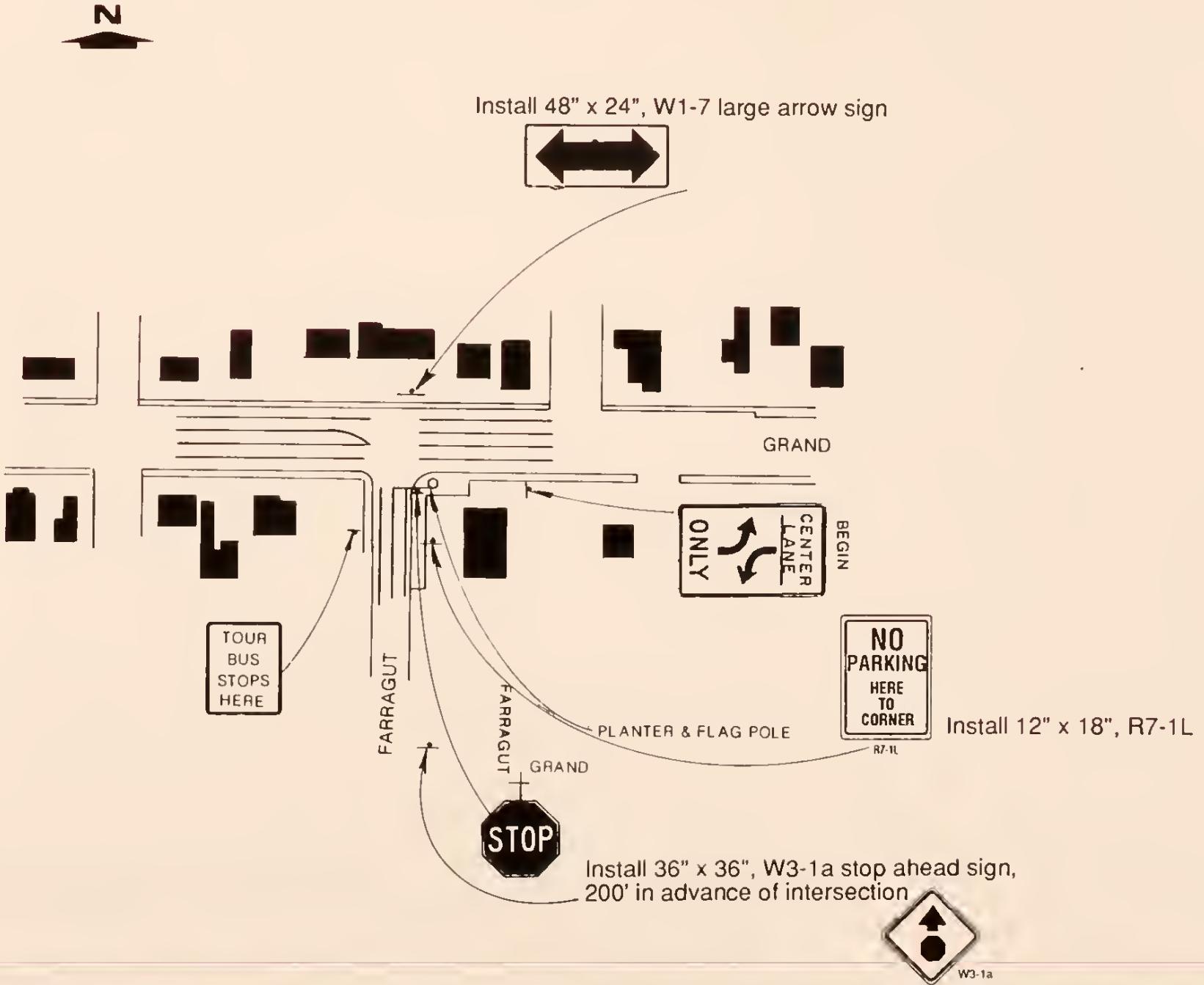
Recommended Improvements

Grand - Farragut

**SITE NO. 6**

Butte-Silver Bow County, Mt.

Fig. No.  
6-2





## SITE 6

### INTERSECTION OF FARRAGUT AVENUE AND GRAND STREET

#### A. Description

This site is a "T" intersection located in the northeast residential area of Butte. Grand and Farragut are classified as collector streets. Grand provides a continuous east-west collector street extending from Harrison Avenue to Continental Drive. Farragut is a north-south collector extending from Bayard to Grand. Both streets are paved and in good condition. Farragut is a two-way, two-lane street with parking both sides. It is a through street except at Grand where the south leg is controlled by a STOP sign. Grand is a 64' street with two lanes, parking both sides and a two-way turn lane.

The 1990 average daily traffic is as follows:

Farragut — south leg .... 3500 VPD  
Grand — east leg ..... 2300 VPD  
Grand — west leg ..... 2500 VPD

The existing conditions are shown on *Figure 6—1*.

#### B. Accident Analysis

Six accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- There were no accidents in 1989.
- Five (83 percent) of the accidents occurred on weekdays.
- There is no seasonal pattern to the accidents.
- All accidents occurred between the hours of 8:00 a.m. and 5:00 p.m. during daylight hours.
- Five (83 percent) of the accidents were angle collisions and the remaining two were sideswipe collisions.
- Failure to yield right-of-way was the cause of four (67 percent) of the accidents.
- There were no injury accidents at this location.
- None of the accidents were alcohol related.

A diagram of accidents is shown on *Figure 6—1*.

#### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. The major cause of accidents at this location was northbound vehicles failing to stop or proceeding into the intersection after stopping and colliding with east and west bound vehicles on Grand. Farragut is a through street, except for signalized intersections, from Bayard to Grand. Northbound drivers become conditioned to having the right-of-way. Additional signing and markings are recommended.

#### D. Recommended Improvements

The following improvements are recommended for this site:

1. Install a 36" x 36", W3-1a stop ahead sign on the south approach. ....	\$140
2. Install a 48" x 24", W1-7 double arrow sign on the north side of the intersection. ....	\$140
3. Install a 12" x 18", R7-1L, "No Parking Here to Corner" sign 30' in advance of the south approach. ....	<u>\$100</u>
Total Cost .....	\$380
Recommended improvements are shown on <i>Figure 6—2</i> .	

## **E. Hazard and Priority Indices**

Based on the information collected and the foregoing analysis, the hazard index for this site is 48.74 and the priority index is 61.30.

SITE NO.7







**Site No. 7: Farragut and Ottawa.** South leg of the intersection of Farragut and Ottawa looking north. *Note:* limited sight distance on northeast and northwest legs.

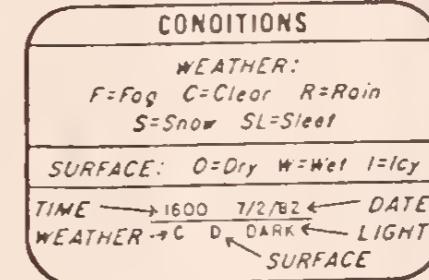
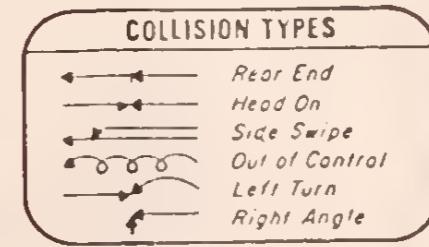
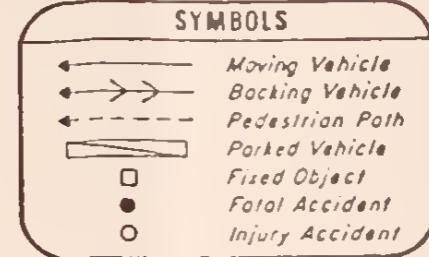
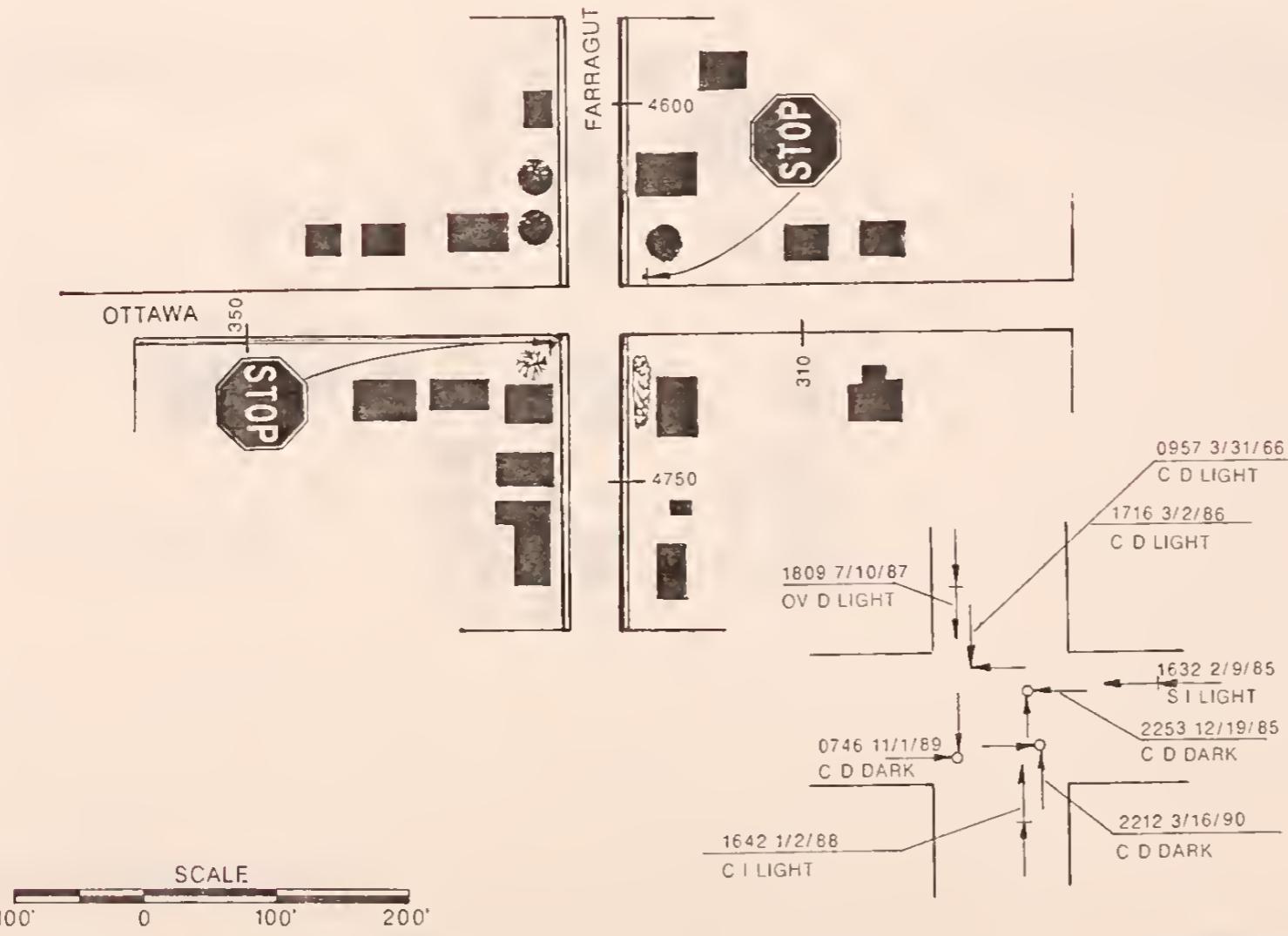


**Site No. 7: Farragut and Ottawa.** East leg of the intersection of Farragut and Ottawa looking west. *Note:* limited sight distance on northeast leg.



## SITE NO. 7 Existing Conditions & Accidents

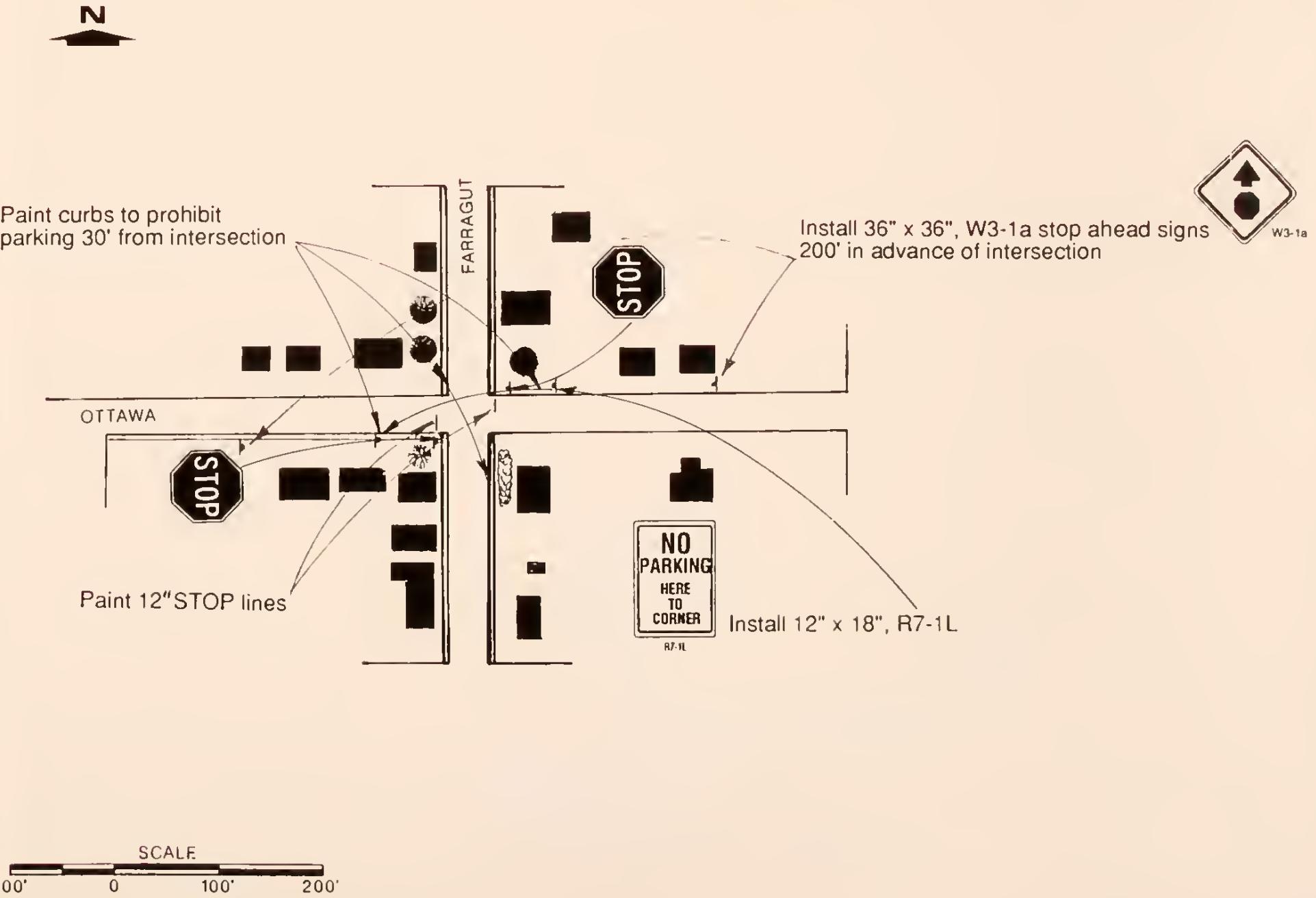
Fig. No.  
7-1





## Recommended Improvements

**SITE NO. 7**  
Ottawa-Silver Bow County, Mt.





## SITE 7

### INTERSECTION OF FARRAGUT AVENUE AND OTTAWA STREET

#### A. Description

This site is a 4-legged intersection located in the residential area east of Harrison Avenue and north of I-90. Farragut Avenue is a two-lane collector street with parking both sides. Ottawa Street is a wide, two-lane residential street with parking both sides. Both streets are paved and in good condition. The residence on the southwest corner of the intersection has several fir trees in the yard. The tree nearest the intersection blocks the sight triangle south on Farragut. The boulevard on the south side of the west approach has been eliminated and paved. Parking is allowed in this area.

Traffic control consists of STOP signs on the east and west approaches.

The 1990 average daily traffic is as follows:

Farragut—north leg ..... 4600 VPD  
Farragut—south leg ..... 4750 VPD  
Ottawa—east leg ..... 310 VPD  
Ottawa—west leg ..... 350 VPD

The existing conditions are shown on *Figure 7-1*.

#### B. Accident Analysis

Eight accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- Three (38 percent) of the accidents occurred in 1988 and 1989.
- The accidents were evenly distributed over days of the week.
- Spring and winter months had the most accidents. Icy road conditions contributed to two (25 percent) of the accidents.
- Five (62 percent) of the accidents were angle collisions and three (38 percent) were rear-end collisions.
- Five (62 percent) of the accidents occurred during daylight hours.
- Major accident causes were speeding, failure to yield right-of-way and drinking.

- All accidents resulted in property damage only.
- Alcohol was involved in two (25 percent) of the accidents.

A diagram of the accidents is shown on *Figure 7-1*.

#### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. The major cause of accidents at this site is due to vehicles on Ottawa running the STOP sign. Rear-end collisions were also the result of following vehicles failing to respond to the STOP signs on Ottawa. Ottawa is a wide, unstriped street. STOP signs at the intersection would increase driver awareness of the intersection.

#### D. Recommended Improvements

The following improvements are recommended for this site:

- |   |       |
|---|-------|
| 1. Install a 36" x 36", W3-1a STOP Ahead sign on the east and west approaches. ....         | \$560 |
| 2. Paint STOP lines on east and west approaches. ( <i>See Figure 11</i> ) .....             | \$40  |
| 3. Paint curb on all approaches to prohibit parking for 30'. ( <i>See Figure 11</i> ) ..... | \$80  |
| 4. Trim tree on southwest approach and hedge on northwest approach. ....                    | \$150 |

5. Install 12" x 18", R7-1L, "No Parking Here to Corner" signs on the east and west approaches. (See *Figure 11*) .....\$200

Total Cost .....\$1030

A diagram of recommended improvements is shown on *Figure 7—2*.

#### **E. Hazard and Priority Indices**

Based on the information collected and the foregoing analysis, the hazard index for this site is 46.15 and the priority index is 59.36.

SITE NO.8







**Site No. 8: Continental Drive and St. Anns.** West leg of the intersection of Continental Drive and St. Anns looking east. *Note:* limited sight distance on the southwest corner.



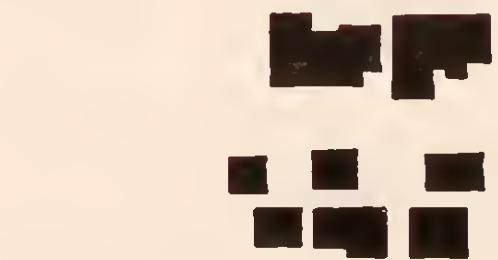
**Site No. 8: Continental Drive and St. Anns.** North leg of the intersection of Continental Drive and St. Anns looking south.



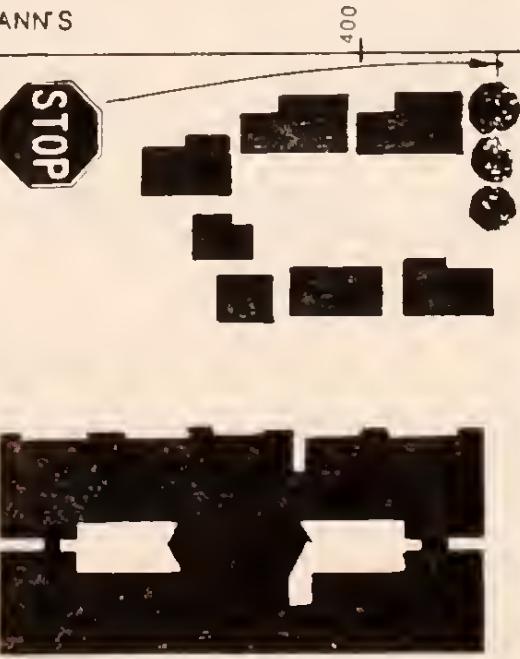
## SITE NO. 8 Existing Conditions & Accidents

Fig. No.  
8-1

2



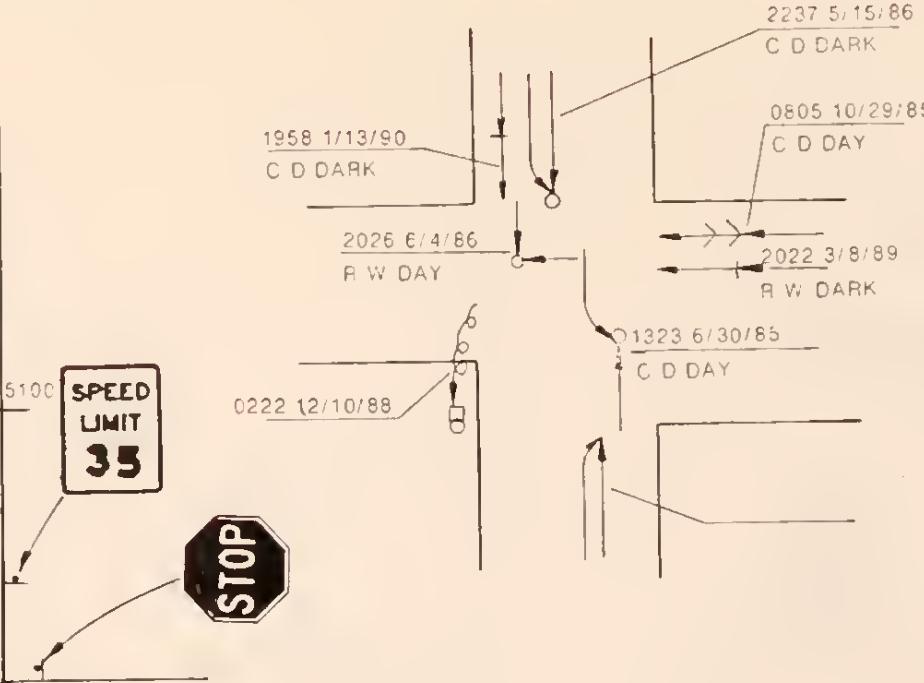
ST. ANNS



SCALE

100' 0 100' 200'

CONTINENTAL DR.



### SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Pedestrian Path
- Parked Vehicle
- Fixed Object
- Fatal Accident
- Injury Accident

### COLLISION TYPES

- Rear End
- Head On
- Side Swipe
- Out of Control
- Left Turn
- Right Angle

### CONDITIONS

WEATHER:  
F=Fog C=Clear R=Rain  
S=Snow SL=Sleet

SURFACE: O=Dry W=Wet I=Icy  
TIME → 1600 7/2/82 ← DATE  
WEATHER → C D DARK ← LIGHT SURFACE



Z

Install 5 — flexible Design A delineators around each radius on the west leg of the intersection

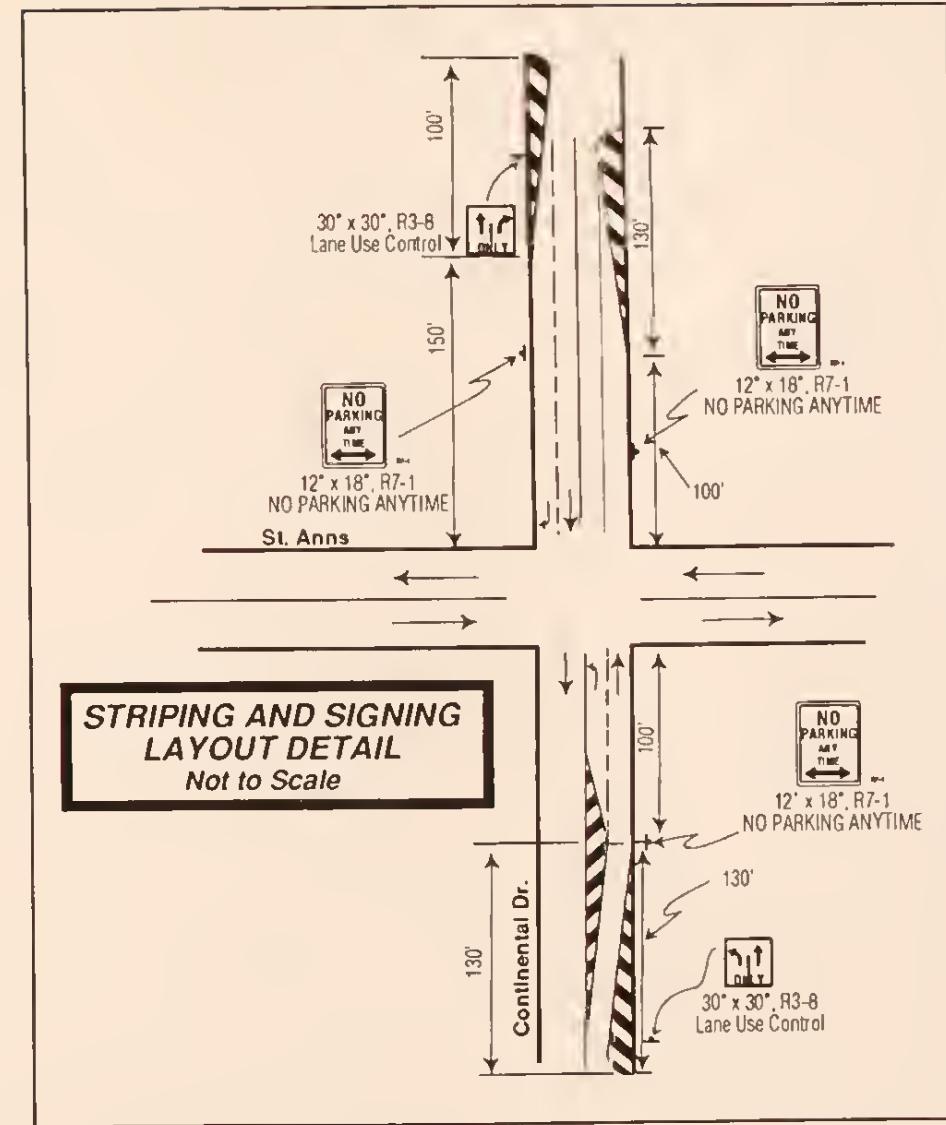
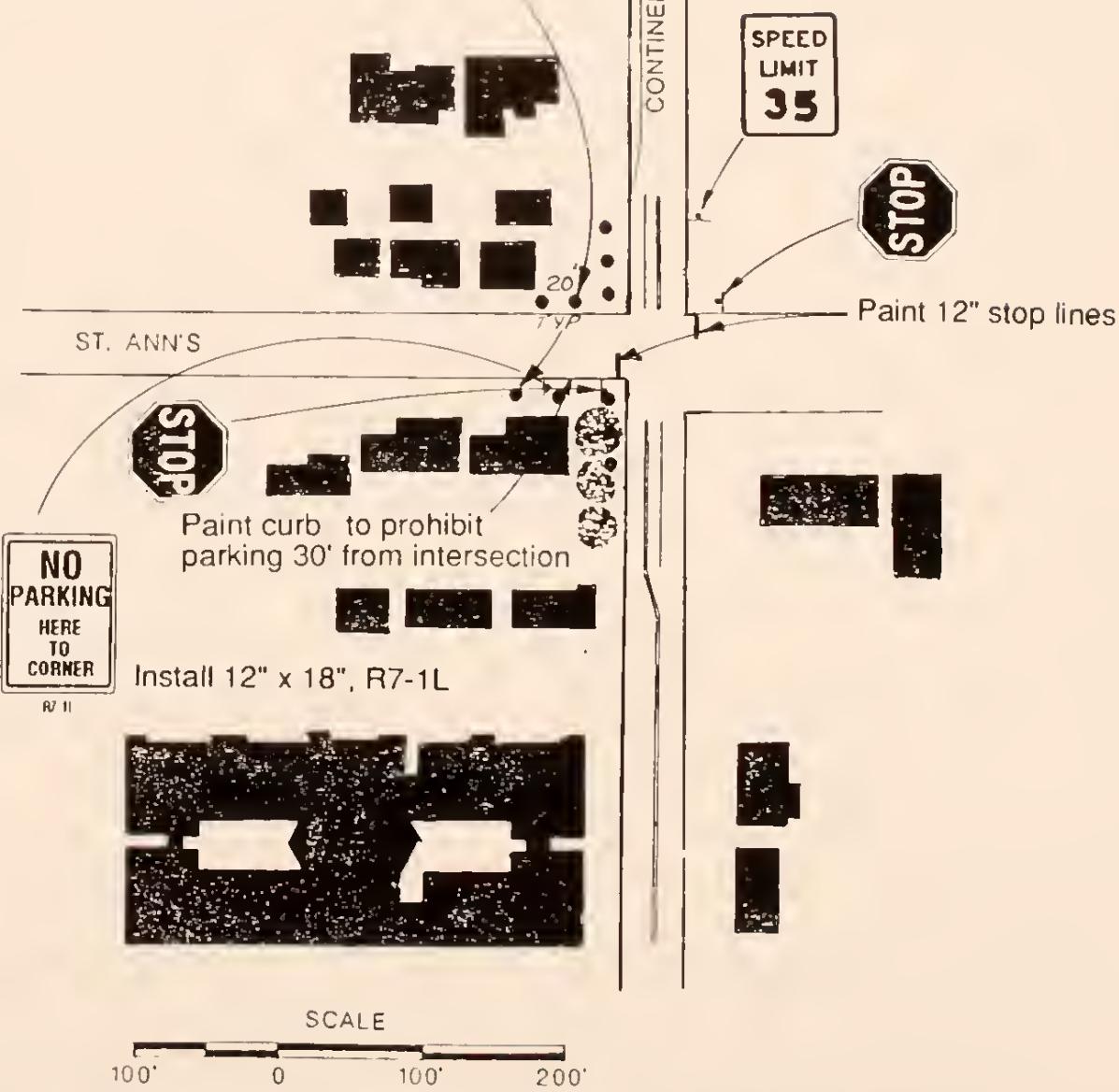


Fig. No.

8—2

## SITE NO. 8

Butte-Silver Bow County, Mt.

### Recommended Improvements

Continental Dr. - St. Ann's



## SITE 8

### INTERSECTION OF CONTINENTAL DRIVE AND ST. ANNS

#### A. Description

This site is located on the east perimeter of Butte. St. Anns is a residential street while Continental Drive is a minor arterial providing access between the uptown area, I-90, the High Altitude Skating Facility and residential areas south of I-90.

The intersection is controlled by STOP signs on St. Anns. Continental Drive has a posted speed limit of 35 mph. During the field survey, it was noted that there were several speed violations with vehicles stopped by enforcement officers on Continental Drive.

The 1990 average daily traffic at this site is as follows:

Continental Drive—north leg	.....	5100 VPD
Continental Drive—south leg	.....	5050 VPD
St. Anns—east leg	.....	120 VPD
St. Anns—west leg	.....	400 VPD

The existing site characteristics are shown on *Figure 8—1*.

#### B. Accident Analysis

Eight accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes:

- Four (50 percent) of the accidents occurred in 1988 and 1989.
  - Four (50 percent) of the accidents occurred on the weekend.
  - There was no seasonal pattern to the accidents.
  - Six (75 percent) of the accidents occurred between 8:00 a.m. and 8:00 p.m.
  - Five (62 percent) of the accidents occurred during hours of darkness.
  - Five (62 percent) of the accidents occurred on a dry roadway.
  - There were two angle, one turning, two rear-end, one fixed object, one sideswiping and one backing collision. The major accident causes were stopped or turning vehicles.
  - Three (38 percent) of the accidents involved alcohol.
  - Four (50 percent) of the accidents resulted in injuries.
- Accident diagrams are shown on *Figure 8—1*.

#### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. Most accidents involved vehicles turning or stopping in Continental Drive to turn on to St. Anns.
2. The 50 percent injury rate can probably be attributed to the high speeds on Continental Drive.
3. The limited sight distance on the west approach looking south was not a factor in any of the accidents. Vehicles entering from this approach have unlimited sight distance to the north and once in the intersection can observe traffic from the south (*see photo*).
4. Due to the high speeds and heavy through traffic on Continental Drive, there is a need to remove turning vehicles from the through traffic stream. Continental Drive has adequate width to provide a left turn bay and right turn deceleration lane at this intersection.

#### **D. Recommended Improvements**

The following improvements are recommended for this site:

1. Install 5—flexible Design A delineators around each radius on the west leg of the intersection. ....\$200
  2. Install a 12" x 18", R7-1L, "No Parking Here to Corner" sign on the west approach. ....\$100
  3. Paint 12" stop line on the west approach and paint curb to prohibit parking 30' from intersection on west approach. ....\$120
  4. Restripe Continental Drive to provide a left turn bay and right turn deceleration lane at this intersection. It is beyond the scope of this project to carry out a study of the Continental Drive corridor in this area. Such a study should be done to determine if left turn bays and right deceleration lanes should be provided at other intersections in this corridor. If it is determined that this is the case, a continuous two-way turn lane should be considered. ....\$500
  5. Install 3—12" x 18", R7-1 NO PARKING ANYTIME signs on the north and south approaches .....\$300
  6. Install 30" x 30", R3-8 Lane Use Control signs on the north and south approaches .....\$280
- Total Cost .....\$1500

Recommended improvements are shown on *Figure 8—2*.

#### **E. Hazard and Priority Indices**

Based on the information collected and the foregoing analysis, the hazard index for this site is 44.63 and the priority index is 58.22.

SITE NO.9







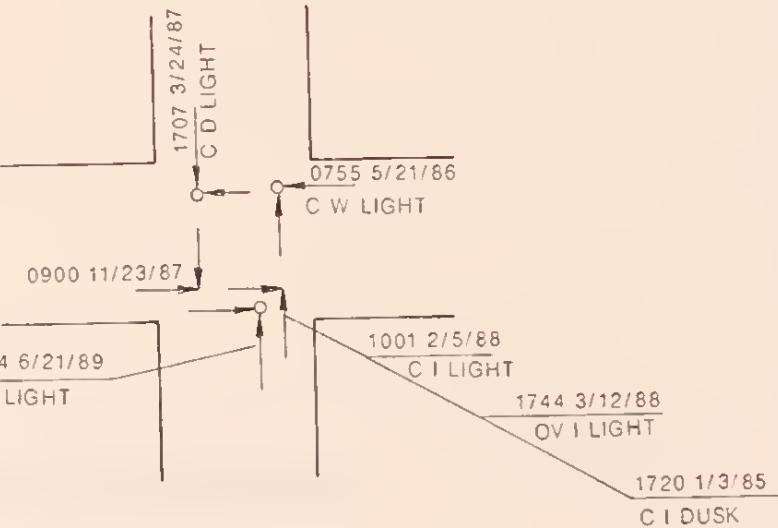
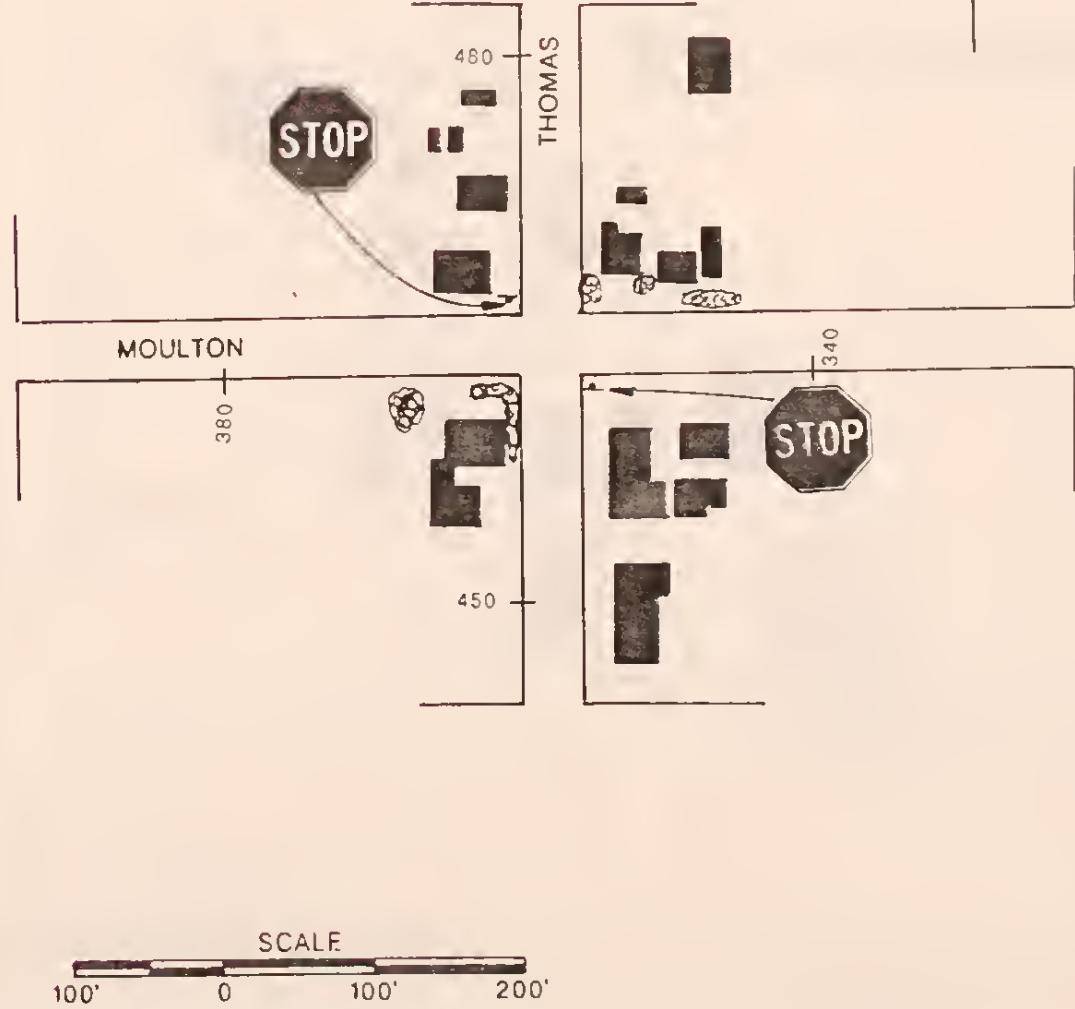
**Site No. 9: Thomas and Moulton.** South leg of the intersection of Thomas and Moulton looking north. *Note:* limited sight distance on the southwest and northwest corners.



**Site No. 9: Thomas and Moulton.** West leg of the intersection of Thomas and Moulton looking east.



**Z**



**SYMBOLS**

- ← → Moving Vehicle
- ← → Backing Vehicle
- ← - - - Pedestrian Path
- Parked Vehicle
- Fixed Object
- Fatal Accident
- Injury Accident

**COLLISION TYPES**

- ← Rear End
- → Head On
- — Side Swipe
- ○ Out of Control
- → Left Turn
- ← Right Angle

**CONDITIONS**

WEATHER:  
F=Fog C=Clear R=Rain  
S=Snow SL=Sleet

SURFACE: O=Dry W=Wet I=Icy

TIME → 1600 7/2/82 ← DATE  
WEATHER → C D DARK ← LIGHT  
SURFACE

**SITE NO. 9 Existing Conditions & Accidents**

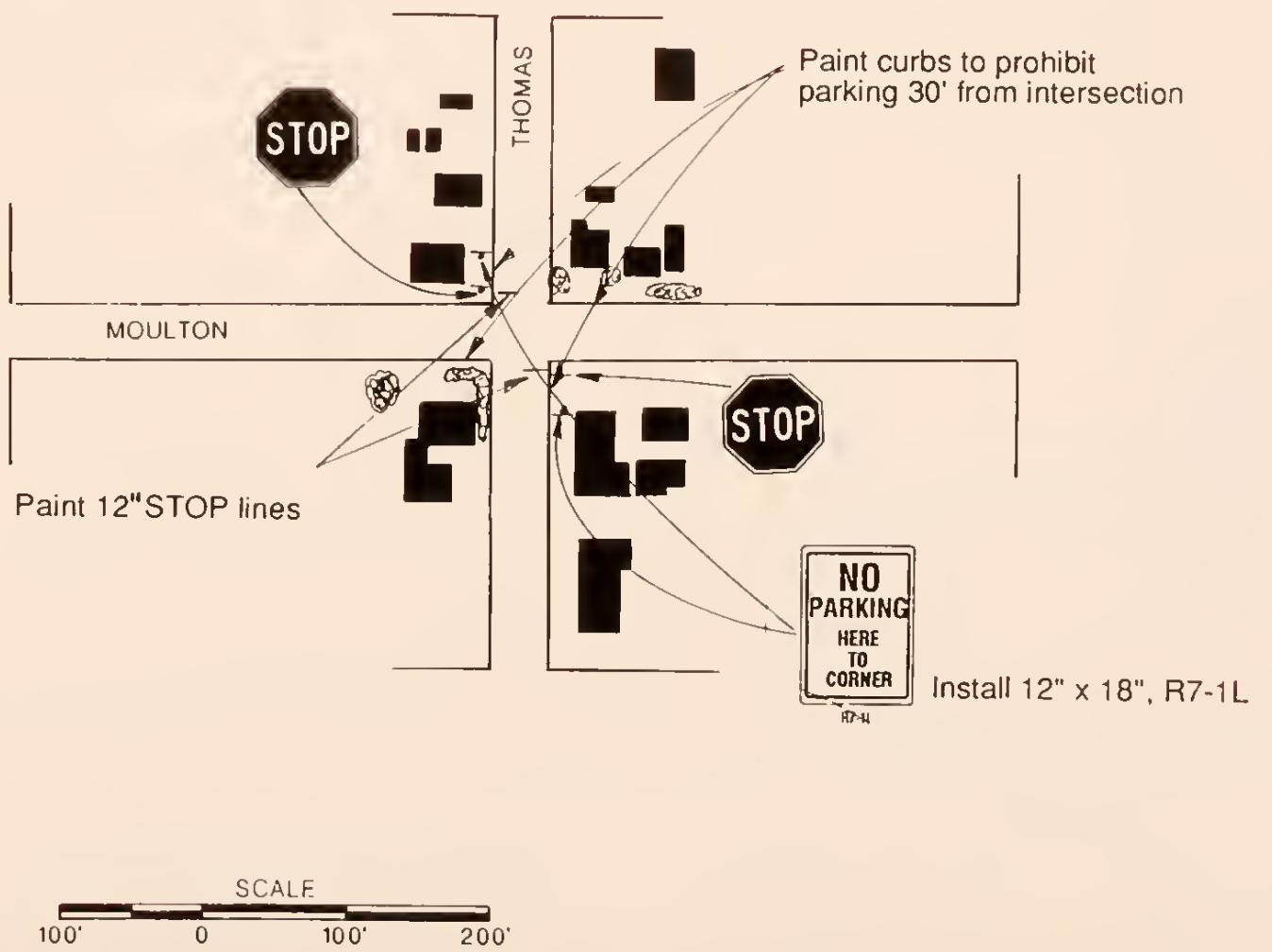
Moulton - Thomas

Butte - Silver Bow County, Mt.

Fig. No.

9-1





**SITE NO. 9**

**Recommended Improvements**

Moulton - Thomas

Butte-Silver Bow County, Mt.

**Fig. No.  
9—2**



## SITE 9

### INTERSECTION OF THOMAS AVENUE AND MOULTON STREET

#### A. Description

This site is located at the intersection of Thomas and Moulton, two, two-way residential streets with parking both sides. The streets are paved and in good condition. There is no striping on either street. The surrounding land use is single family residential. The intersection is controlled by STOP signs on the north and south approaches. Moulton is the through street.

The 1990 average daily traffic is as follows:

Thomas—north leg .....	380 VPD
Thomas—south leg .....	340 VPD
Moulton—east leg .....	450 VPD
Moulton—west leg .....	480 VPD

A diagram of present conditions is shown on *Figure 9—1*.

#### B. Accident Analysis

Seven accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- Three (43 percent) of the accidents occurred in 1988 and 1989.
- All accidents occurred during weekdays.
- There was no seasonal pattern to the accidents.
- All accidents occurred between the hours of 7:00 a.m. and 6:00 p.m.
- Five (71 percent) of the accidents occurred when the road was wet, snowpacked or icy.
- All accidents were angle collisions.
- Failure to yield right-of-way was the cause of five (71 percent) of the accidents.
- One accident (14 percent) resulted in injuries.
- Alcohol was involved in one accident.

The diagram of accidents is shown on *Figure 9—1*.

#### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. Accident records show that all reported accidents occurred before the STOP signs were installed on the north and south legs of the intersection. This improvement will probably result in a reduction of accidents which were primarily caused by failure to yield right-of-way.

#### D. Recommended Improvements

The following improvements are recommended for this site:

1. Paint 12" stop lines on the north and south approaches. ....\$40
2. Paint curb on all approaches to prohibit parking for 30'. (*See Figure 11*) .....\$80
3. Install 12" x 18", R7-1L, "No Parking Here to Corner" signs on the north and south approaches. (*See Figure 11*) \$200

Total Cost .....\$320

A diagram of recommended improvements is shown on *Figure 9—2*.

#### E. Hazard and Priority Indices

Based on the information collected and the foregoing analysis, the hazard index for this site is 44.63 and the priority index is 58.22.



SITE NO.10







**Site No. 10: Roosevelt Drive — curve.** North approach of curve on Roosevelt Drive looking south. *Note:* brush on inside of curve.

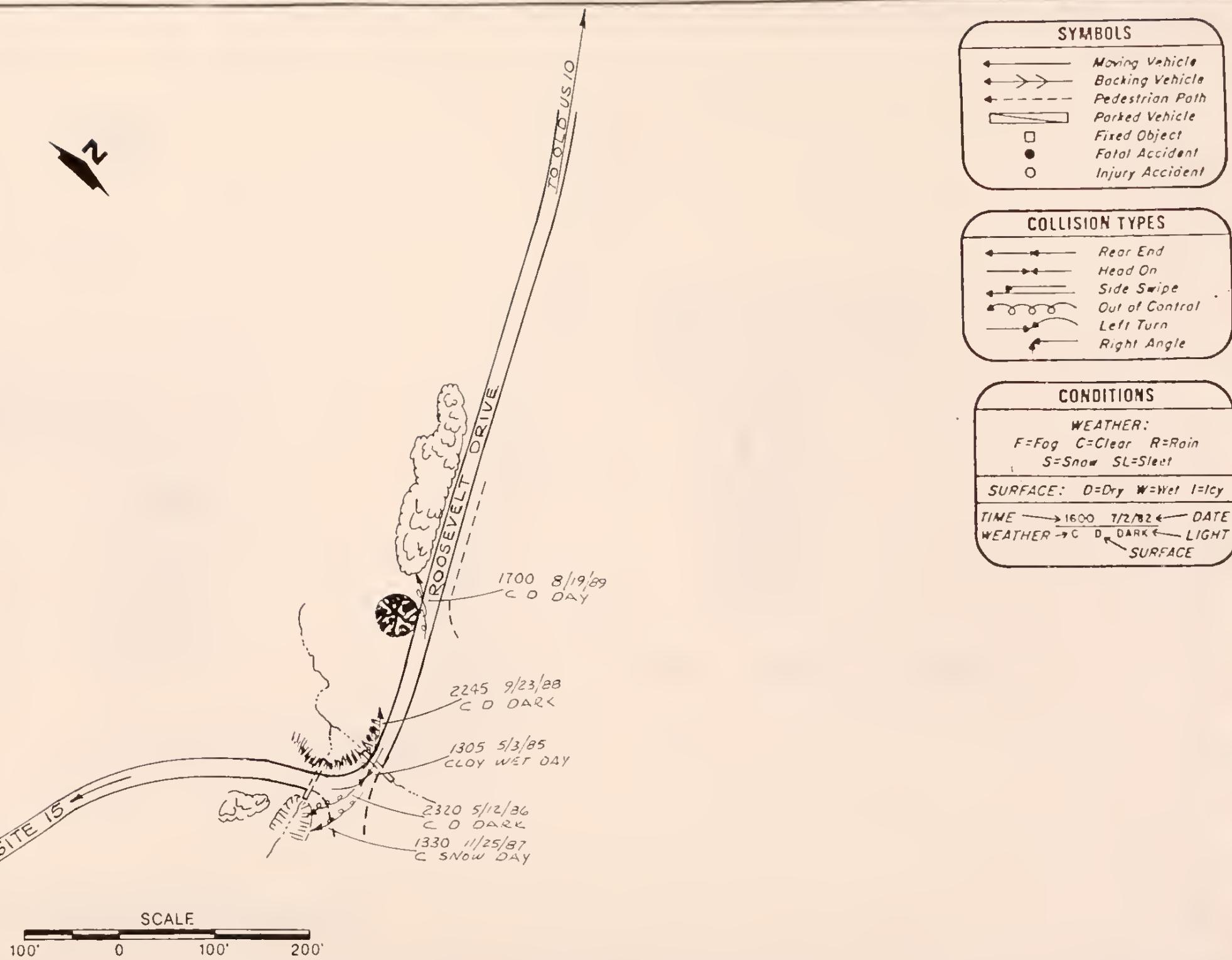


**Site No. 10: Roosevelt Drive — curve.** Southwest approach of curve on Roosevelt Drive looking northeast.



## SITE NO. 10 Existing Conditions & Accidents

Butte-Silver Bow County, Mt. Roosevelt Dr. - Curve





**SITE NO. 10**      **Recommended Improvements**

Roosevelt Dr. - Curve

Butte-Silver Bow County, Mt.

Fig. No.  
10—2





## **SITE 10**

### **ROOSEVELT DRIVE — CURVE**

#### **A. Description**

This site is a sharp curve on Roosevelt Drive located in Section 3, Range 7W, Township 1N. The site is .5 miles south of the intersection of Roosevelt Drive and old U.S. Highway 10 (FAS 375). The curve is located at the crossing of two 48" culverts. The road is 18' to 22' in width and has a gravel surface. The road is bounded on the west by a creek and on the east by a bank. There is a pullout on the south side of the curve. There are no traffic control devices at the site.

The 1990 average daily traffic is 190 VPD. There is evidence that this road leads to some recreation areas where beer parties

have taken place and to fishing access points along the creek. There is probably a large seasonal variation in traffic.

A diagram of existing conditions is shown on *Figure 10—1*.

#### **B. Accident Analysis**

Five accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- One accident has occurred each year over the 5-year period.
- Four (80 percent) of the accidents occurred on weekdays.
- All accidents occurred in summer or fall.
- The accidents occurred between 1:00 p.m. and midnight.
- Three (60 percent) of the accidents occurred in daylight.
- The road was dry during 60 percent of the accidents.
- Four (80 percent) of the accidents involved single vehicles leaving the roadway.
- Three (60 percent) of the accidents were attributed to speed or reckless driving.
- There were no injury or fatality accidents at this location.

- Alcohol was involved in two of the accidents.

The accident diagram is shown on *Figure 10—1*.

#### **C. Evaluation**

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. Although this site is not out of character with the rest of the road, the fact that it is the first sharp curve south of old U.S. 10 means that drivers must immediately cope with a low speed, winding roadway after traveling on a much higher design roadway. Drivers should be given advance information relating to the curve and visual guidance around the sharp curve.

#### **D. Recommended Improvements**

The following improvements are recommended for this site:

1. Install a 30" x 30", W1-1R turn sign with an 18" x 18", W13-1, 20 mph advisory speed plate on the north approach. \$200
2. Install a 30" x 30", W1-1L, turn sign with an 18" x 18", W13-1, 20 mph advisory speed plate on the west approach. \$200
3. Install 7 — Design A, flexible delineators on the outside of the curve. ....\$140
4. Install 8 — Design A, flexible delineators on the inside of the curve. .....\$160

5. Trim bushes inside curve to 3' height.  
.....\$200

Total Cost ..... \$900

Recommended improvements are shown  
on *Figure 10—2*.

#### **E. Hazard and Priority Indices**

Based on the information collected and  
the foregoing analysis, the hazard index  
for this site is 43.39 and the priority index  
is 57.29.

SITE NO.11







**Site No. 11: Yale and Hancock.** South leg of the intersection of Yale and Hancock looking north.



**Site No. 11: Yale and Hancock.** West leg of the intersection of Yale and Hancock looking east.

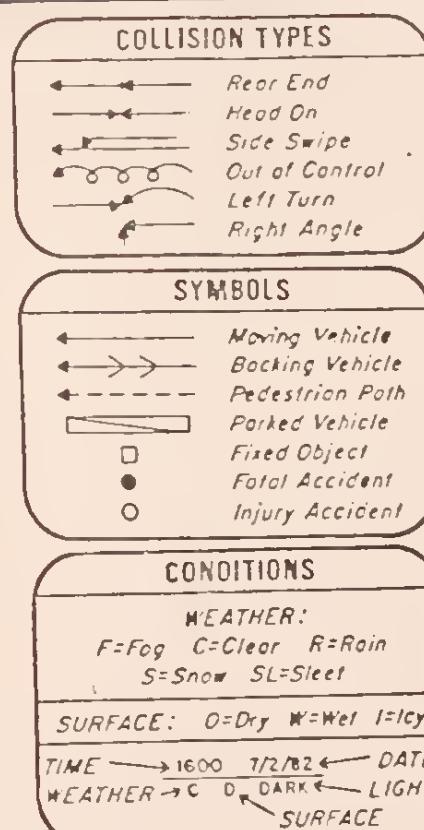
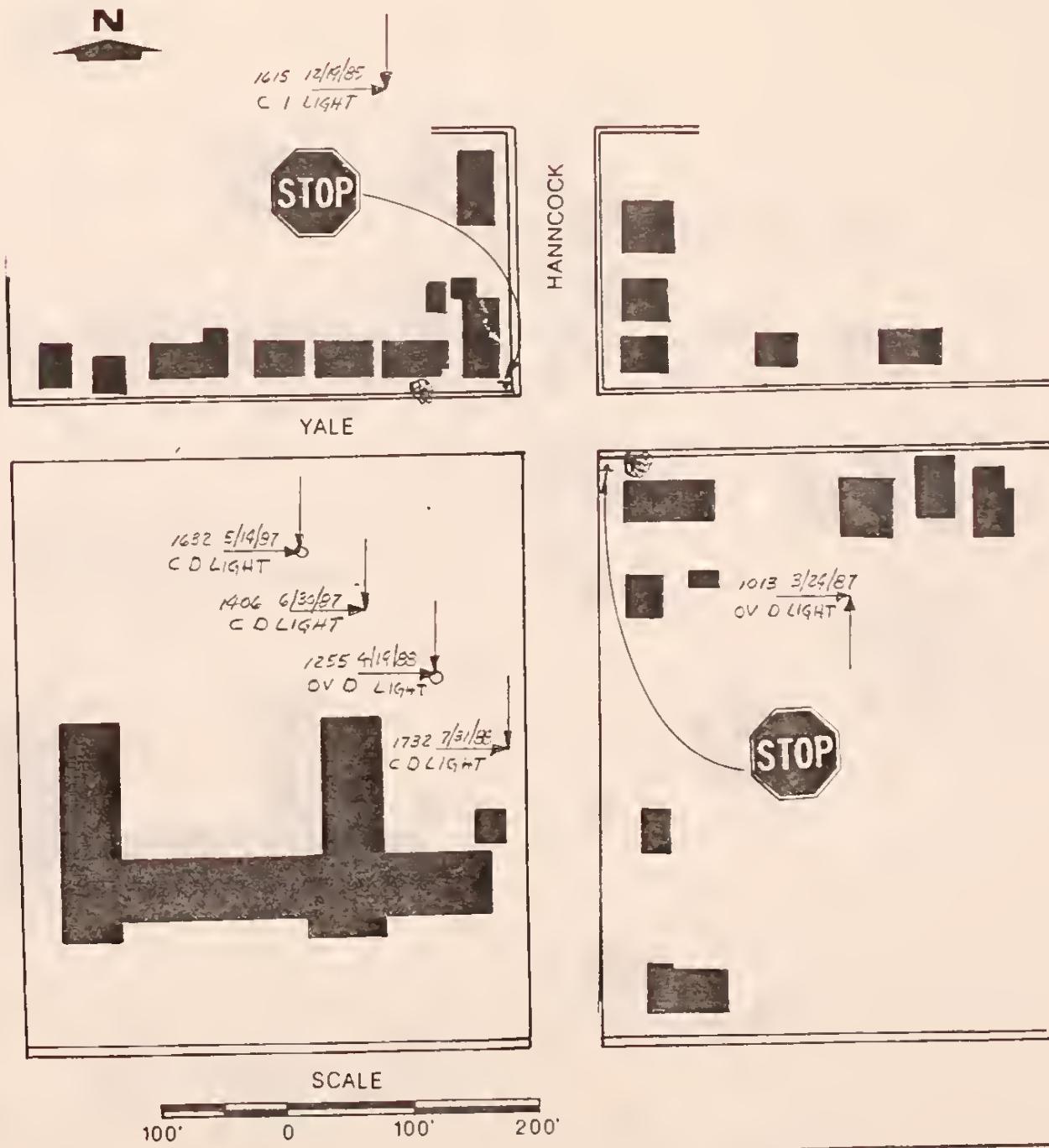


## SITE NO. 11 Existing Conditions & Accidents

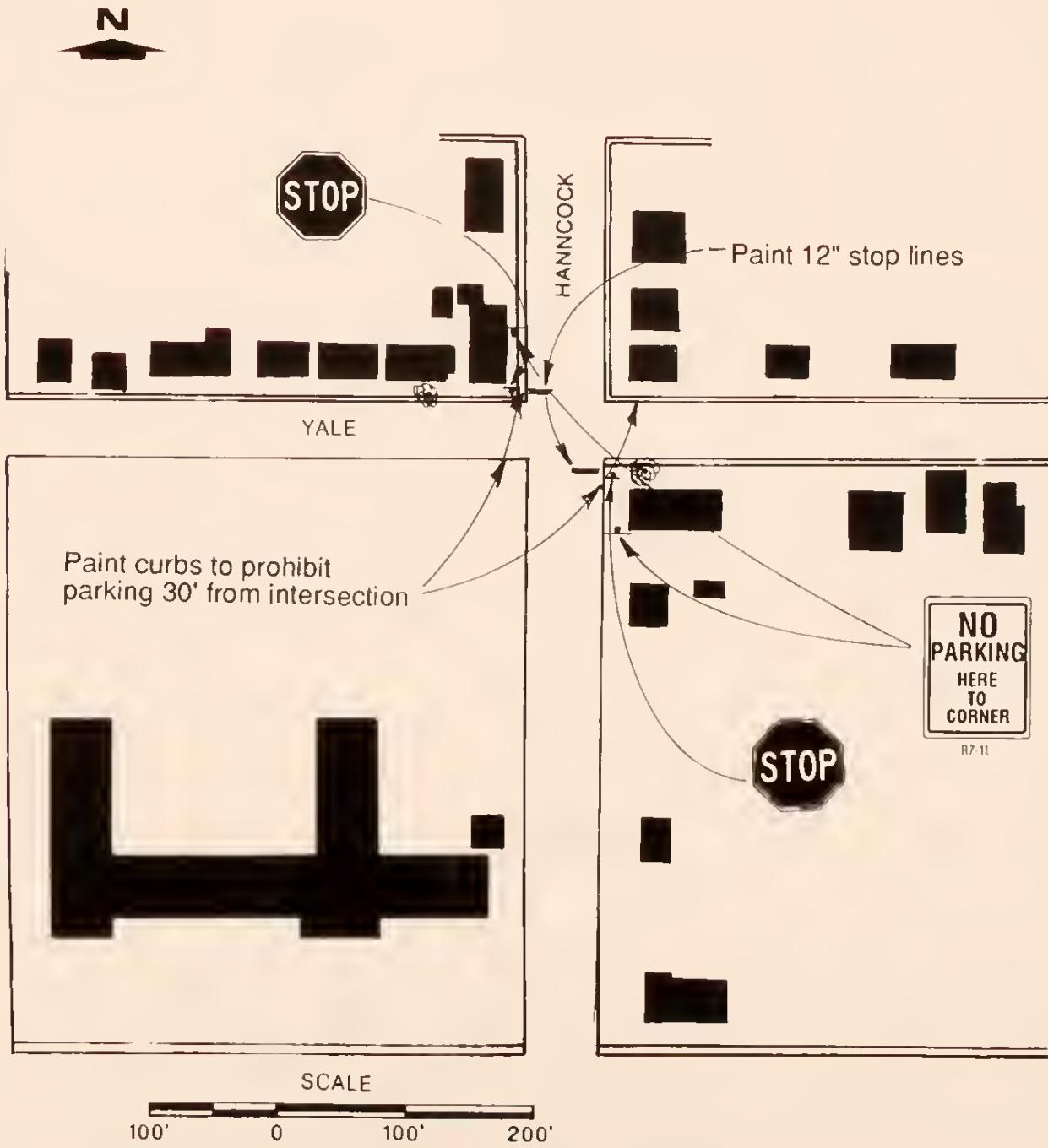
Yale - Hancock

Butte-Silver Bow County, Mt.

Fig. No.  
11-1







**SITE NO. 11**  
Butte-Silver Bow County, Mt.

**Fig. No.**  
**11—2**

**Recommended Improvements**

Yale - Hancock



## **SITE 11**

### **INTERSECTION OF YALE AND HANCOCK**

#### **A. Description**

This site is located one block west of Continental Drive. Both streets are wide (40'-42') two-lane residential streets with a paved surface in good condition.

The intersection is open with good sight distance on all approaches. The intersection is controlled by STOP signs located on the north and south legs.

The 1990 average daily traffic is as follows:

Yale — east leg .....	900 VPD
Yale — west leg .....	950 VPD
Hancock— north leg ....	2000 VPD
Hancock— south leg ....	2040 VPD

The existing site characteristics are shown on *Figure 11—1*.

#### **B. Accident Analysis**

Six accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes:

- Five (83 percent) of the accidents occurred in 1987 and 1988. No accidents were reported in 1989. STOP signs were installed in 1988.
- Five (83 percent) of the accidents occurred on a weekday.
- Five (83 percent) of the accidents occurred during Spring and Summer.
- All accidents occurred between 10:00 a.m. and 5:00 p.m.
- Five (83 percent) of the accidents occurred during dry and clear road and weather conditions.
- All accidents were angle collisions.
- All accidents involved eastbound vehicles.
- The accidents were attributed to the following causes:

Alcohol .....	33 percent
Reckless driving .....	17 percent
Speed .....	17 percent
Failure to yield R.O.W. ....	33 percent

Accident diagrams are shown on *Figure 11—1*.

#### **C. Evaluation**

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. The installation of STOP signs on Hancock in 1988 appears to have solved the problem of failing to yield the right-of-way at this site. There were no accidents in 1989.

#### **D. Recommended Improvements**

The following improvements are recommended for this site:

1. Paint 12" stop lines on the north and south approaches. .... \$40
  2. Paint curb on all approaches to prohibit parking for 30'. (*See Figure 11*) ..... \$80
  3. Install 12" x 18", R7-1L, "No Parking Here to Corner" signs on the north and south approaches. (*See Figure 11*) \$200
- Total Cost ..... \$320

Recommended improvements are shown on *Figure 11—2*.

#### **E. Hazard and Priority Indices**

Based on the information collected and the foregoing analysis, the hazard index for this site is 43.26 and the priority index is 57.20.



SITE NO.12





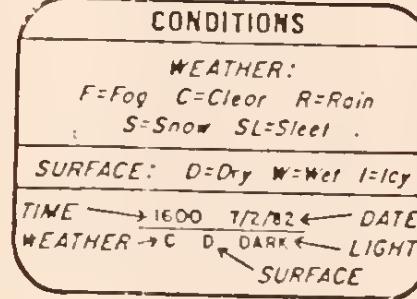
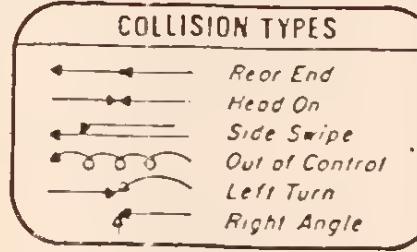
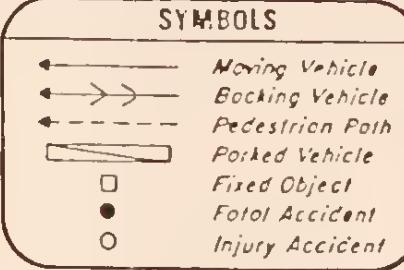
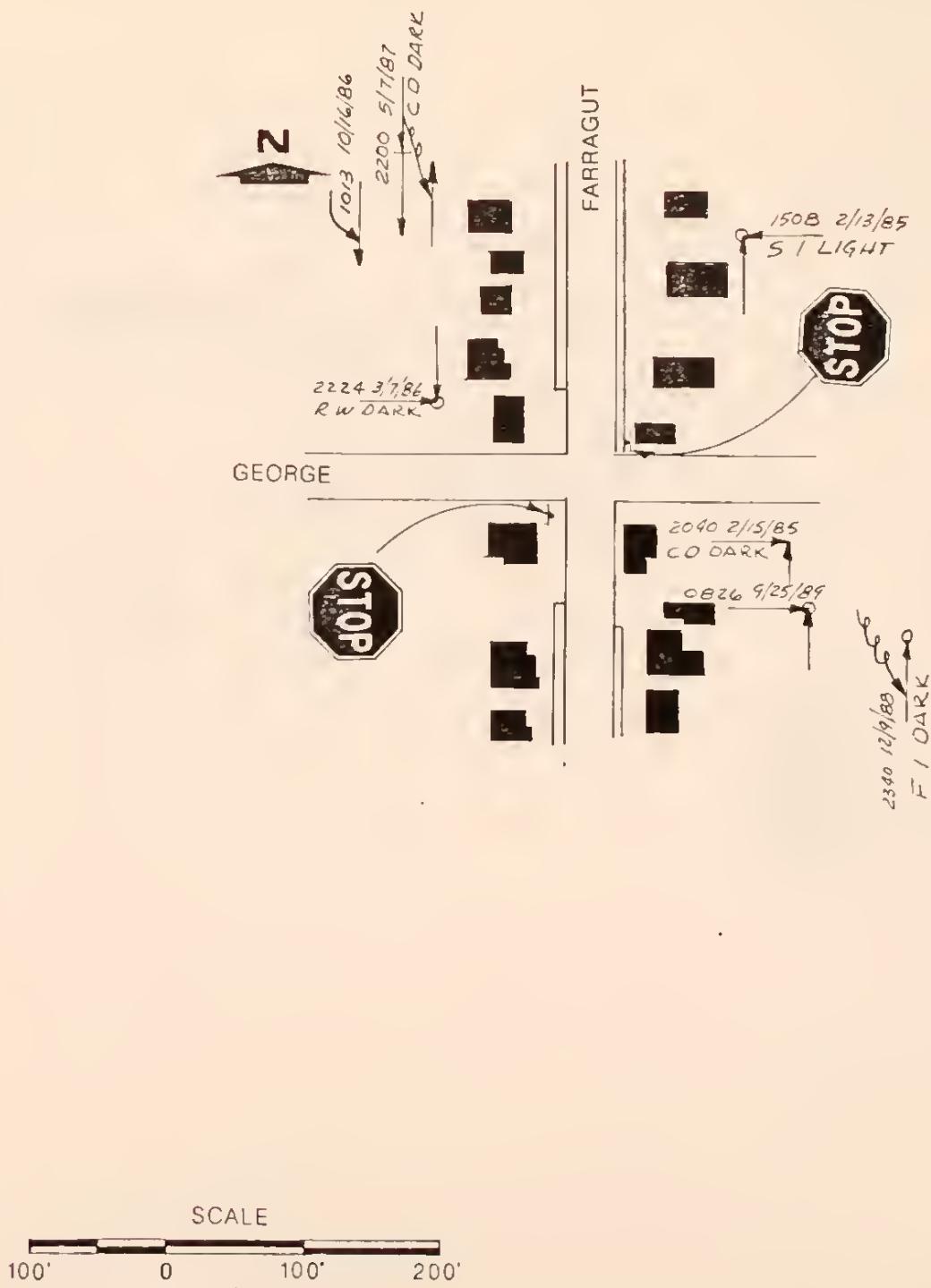


**Site No. 12: Farragut and George.** South leg of the intersection of Farragut and George looking north.



**Site No. 12: Farragut and George.** West leg of the intersection of Farragut and George looking east.





**SITE NO. 12**

*Butte-Silver Bow County, Mt.*

**Existing Conditions and Accidents**

**George - Farragut**

**Fig. No.  
12—1**

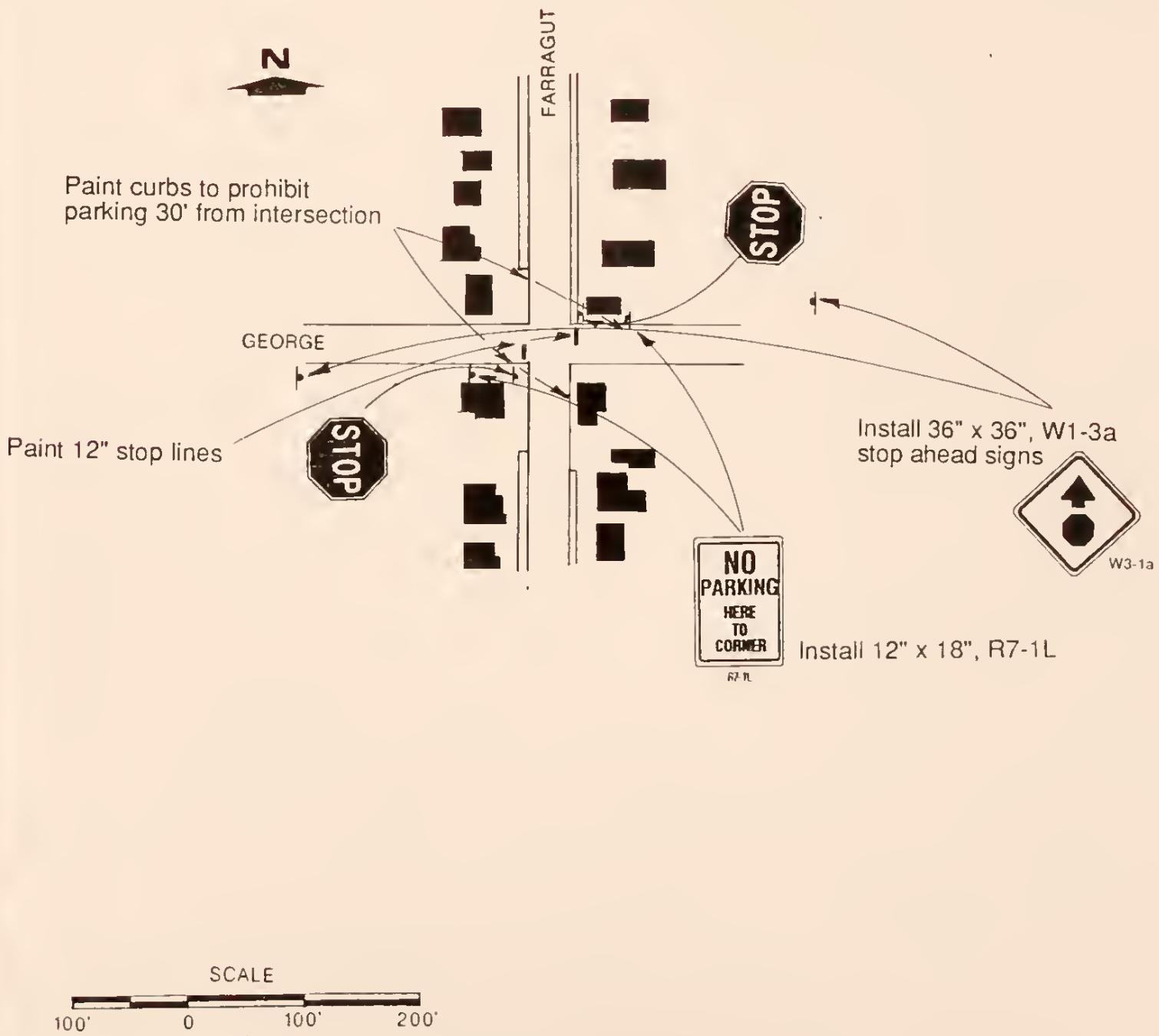


**SITE NO. 12** *Recommended Improvements*

George - Farragut

Butte-Silver Bow County, Mt.

Fig. No.  
12-2





## SITE 12

### INTERSECTION OF FARRAGUT AVENUE AND GEORGE STREET

#### A. Description

This site is a 4-legged intersection located in the northeast residential area of Butte. Farragut is a collector street providing a continuous, through connector from Bayard to Grand. Major intersections are controlled by signals. George is a minor east-west collector street extending from Sheridan on the east to Montana Avenue. The surrounding land use is suburban, single family residential. Traffic control devices at the site consists of STOP signs on George.

The 1990 average daily traffic is as follows:

Farragut — north leg .... 3750 VPD  
Farragut — south leg ... 3880 VPD  
George — east leg ..... 1600 VPD  
George — west leg ..... 1750 VPD

Existing conditions are shown on *Figure 12—1*.

#### B. Accident Analysis

Eight accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- The accidents were randomly distributed over the five year period from 1985 through 1989.
- There is no daily pattern to the accidents.
- The seasonal distribution of accidents was as follows:

spring .....	2
summer .....	1
fall.....	2
winter .....	3

- Five (63 percent) of the accidents occurred between 8:00 p.m. and midnight during hours of darkness.
- Six (75 percent) of the accidents occurred on dry streets.
- Six (75 percent) of the accidents were angle collisions.
- Possible violations were as follows:

drinking .....	2
reckless driving.....	2
speed.....	2
right-of-way .....	2

- All accidents resulted in property damage only.

Accident diagrams are shown on *Figure 12—1*.

#### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. Half of the accidents involved vehicles on George Street, running the STOP sign. Street conditions were not cited as a major problem. Review of the accident data indicates there is a need to increase driver expectancy of the STOP sign.

#### D. Recommended Improvements

The following improvements are recommended for this site:

1. Install 36" x 36", W3-1a stop ahead signs on the east and west approaches of the intersection. .... \$280
2. Paint 12" stop lines on the east and west approaches of the intersection. .... \$40
3. Paint curbs at the intersection to prohibit parking for 30' on all approaches. .... \$80

4. Install 12" x 18", R7-1L, "No Parking Here to Corner" signs on the east and west approaches. (See *Figure 11*) .....\$200

Total Cost ..... \$600

Recommended improvements are shown on *Figure 12—2*.

#### **E. Hazard and Priority Indices**

Based on the information collected and the foregoing analysis, the hazard index for this site is 41.94 and the priority index is 56.20.

SITE NO. 13







**Site No. 13: Floral and Sheridan.** South leg of the intersection of Sheridan and Floral looking north.



**Site No. 13: Floral and Sheridan.** East leg of the intersection of Sheridan and Floral looking west. *Note:* limited sight distance from west leg looking south.

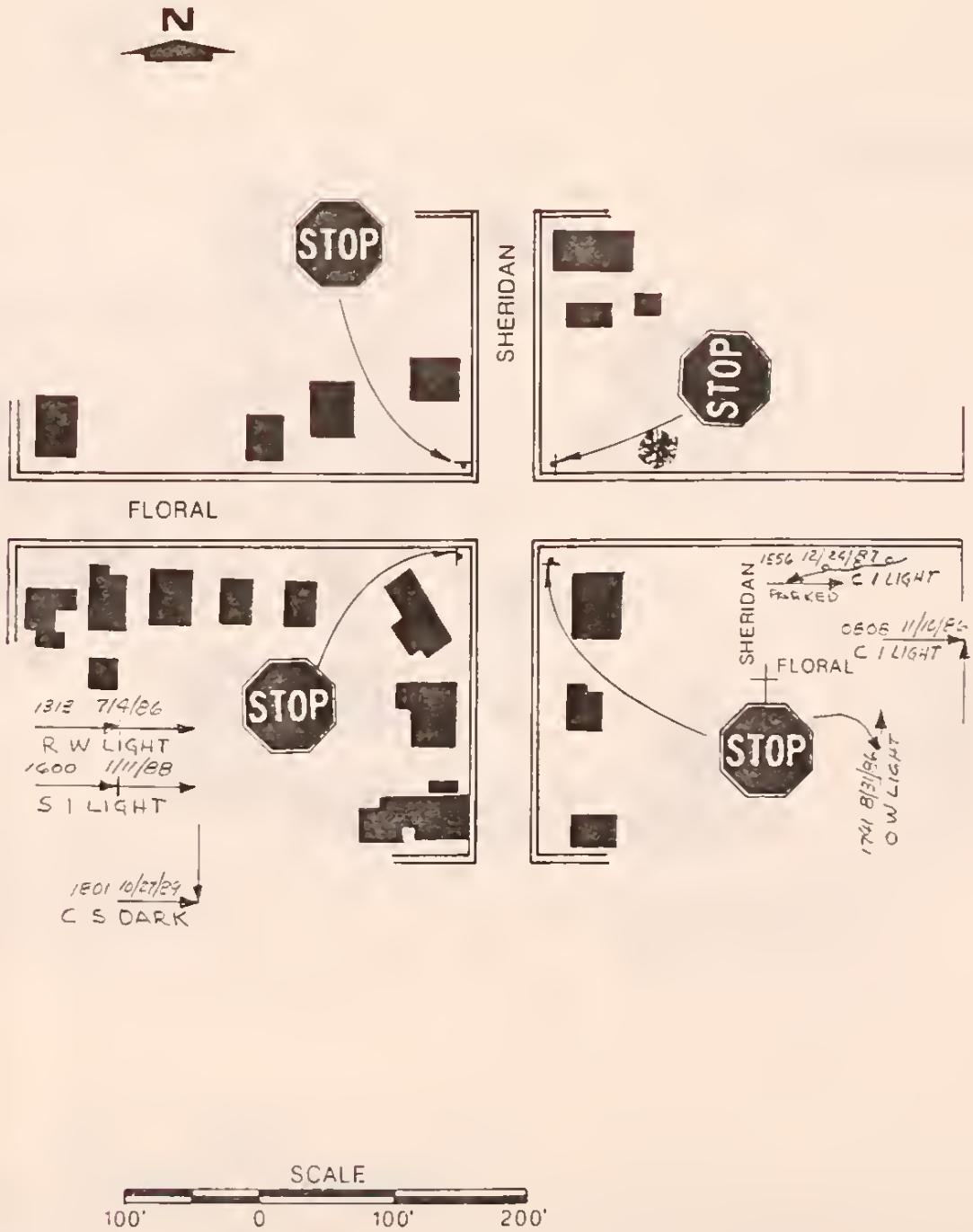


## SITE NO. 13 Existing Conditions & Accidents

Floral - Sheridan

**Butte-Silver Bow County, Mt.**

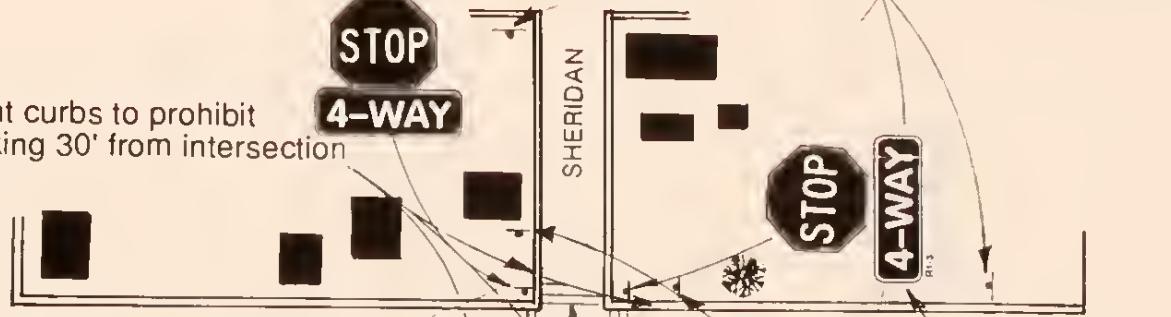
Fig. No.  
13-1



N



I paint curbs to prohibit parking 30' from intersection



Install 36" x 36" W3-1a stop ahead signs  
200' in advance on all approaches



A circular traffic diagram centered around a stop sign. A curved line labeled "STOP" leads to a rectangular sign labeled "4-WAY". The diagram includes several blacked-out sections and arrows indicating flow.



Paint 12" STOP lines and pedestrian crosswalks

Install 12" x 18", R7-1L

Add 12" x 6", R1-3  
Supplemental Plate

A horizontal scale bar with markings at 100', 0, 100', and 200'. The word "SCALE" is centered above the bar.

## *Recommended Improvements*

SITE NO. 13

Flora - Shortan

Fig. No.  
13-2



The 1990 average daily traffic is as follows:

Sheridan — north leg ... 1920 VPD  
Sheridan — south leg ... 2050 VPD  
Floral — east leg ..... 1970 VPD  
Floral — west leg ..... 2100 VPD

A diagram of existing conditions is shown on *Figure 13—1*.

### B. Accident Analysis

Six accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- Five (83 percent) of the accidents occurred on weekdays.
- Three (50 percent) of the accidents occurred during winter months.
- All accidents occurred between the hours of 7:00 a.m. and 7:00 p.m.
- Five (83 percent) of the accidents occurred during daylight hours.
- All accidents occurred on wet, snowpacked or icy streets.
- Four (67 percent) of the accidents were angle collisions and the remaining 33 percent were rear-end collisions.
- Speed contributed to 83 percent of the accidents.
- Alcohol was involved in one accident.

## SITE 13

### INTERSECTION OF SHERIDAN AVENUE AND FLORAL STREET

#### A. Description

This site is a four-legged intersection located 4 blocks north of I-90 and 9 blocks east of Harrison Avenue. Floral is an east-west minor collector and Sheridan is a north-south collector. Both street are two-way, two-lane with parking both sides. Sheridan overpasses I-90 providing access to residential areas south of I-90 providing access to residential areas south of I-90 and to the golf course. The intersection is controlled by a four-way STOP. *The Floral Food Center*, a neighborhood grocery, is located on the southwest corner of the intersection.

- There were no injury accidents.

A diagram of accidents is shown on *Figure 13—1*.

#### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. Rear-end collisions and vehicles running the STOP signs indicate that drivers are failing to perceive the upcoming STOP. The intersection is an isolated 4-way stop surrounded by uncontrolled intersections. There is a need to increase driver expectancy by giving information prior to arriving at the STOP and more positive marking at the intersection. During the survey it was noted that this intersection has a significant amount of pedestrian traffic. Crosswalks should be painted on all approaches.

#### D. Recommended Improvements

The following improvements are recommended for this site:

1. Install a 36" x 36", W3-1a STOP Ahead sign on all approaches. ..... \$560
2. Paint 12" stop lines on all approaches. (*See Figure 11*) ..... \$40
3. Paint curb on all approaches to prohibit parking for 30'. (*See Figure 11*) ..... \$80
4. Paint crosswalks on all approaches. (*See Figure 11*) ..... \$320

5. Install 12" x 18", R7-1L, "No Parking Here to Corner" signs on all approaches 20' in advance of crosswalks. (See Figure 11)

..... \$400

6. Install 12" x 6", R1-3, 4-Way supplemental plates on all STOP signs. .... \$400

Total Cost ..... \$1660

A diagram of recommended improvements is shown on *Figure 13—2*.

#### **E. Hazard and Priority Indices**

Based on the information collected and the foregoing analysis, the hazard index for this site is 41.29 and the priority index is 55.72.

SITE NO.14





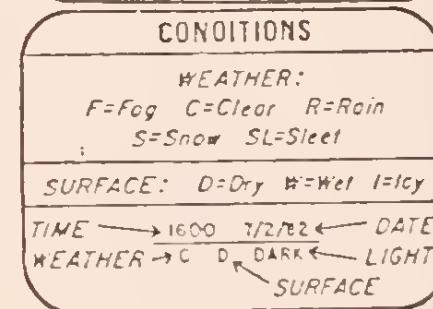
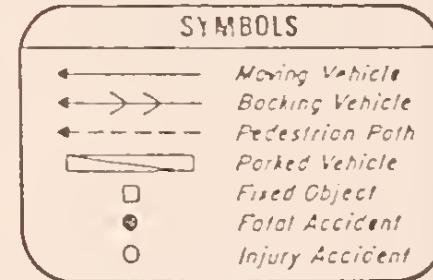
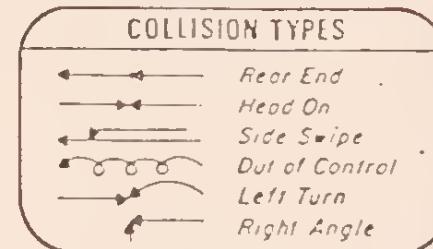
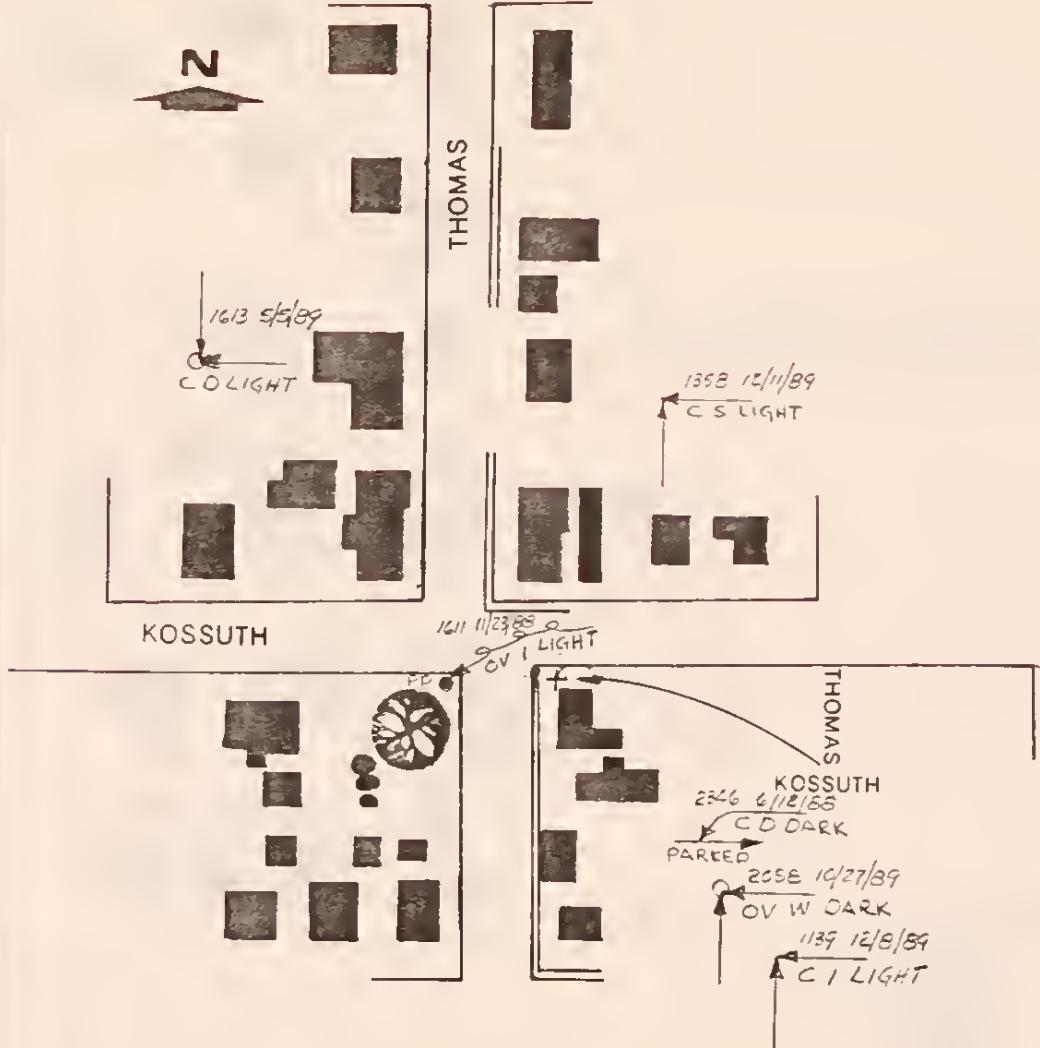


**Site No. 14: Thomas and Kossuth.** South leg of the intersection of Thomas and Kossuth looking north. *Note:* offset north leg and limited sight distance from south leg west.



**Site No. 14: Thomas and Kossuth.** West leg of the intersection of Thomas and Kossuth looking east.





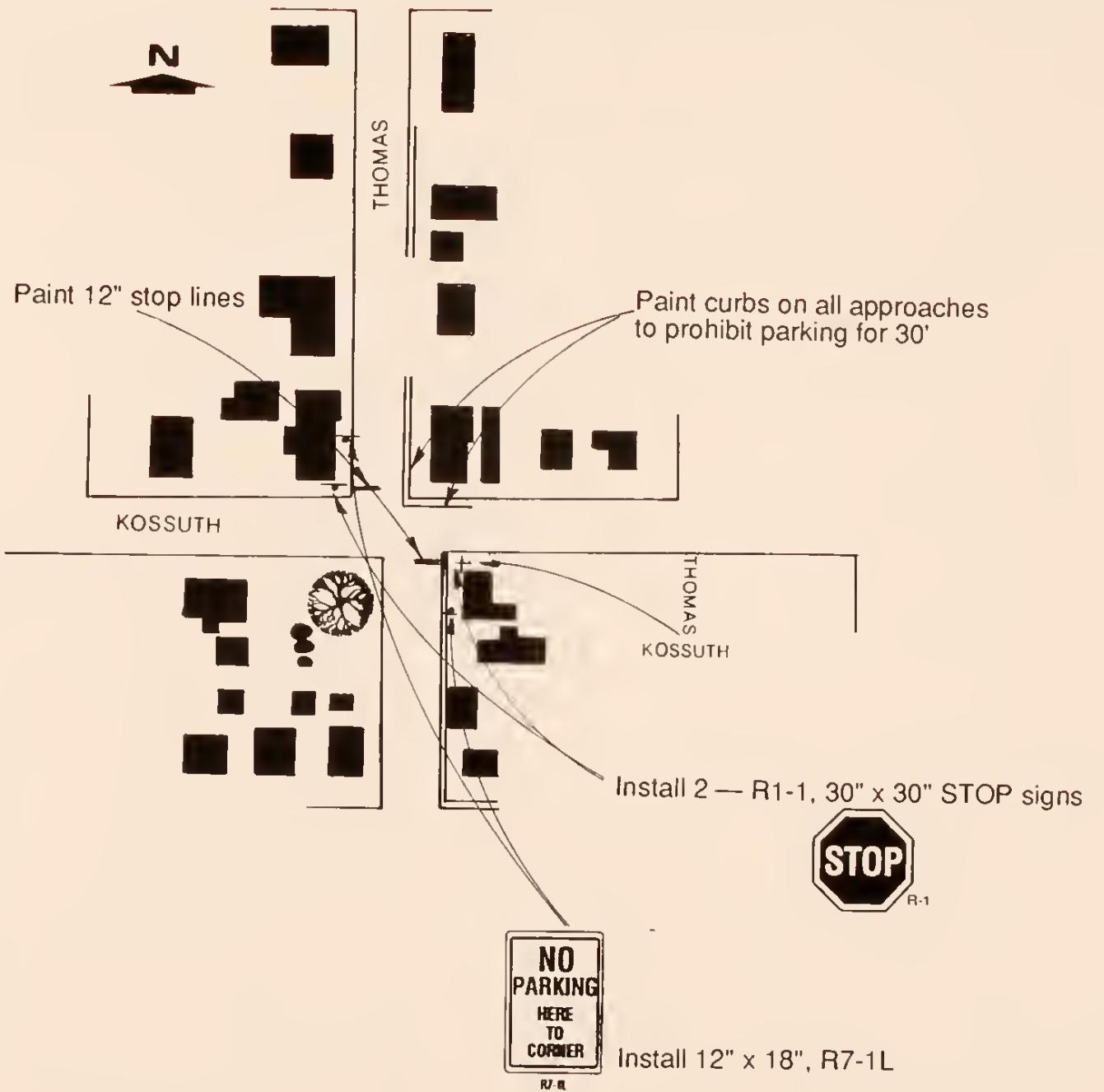
**SITE NO. 14 Existing Conditions & Accidents**

Battle-Silver Bow County, Mt.

Kossuth - Thomas

Fig. No.  
14-1





### SITE NO. 14 Recommended Improvements

Butte-Silver Bow County, Mt.

Kossuth - Thomas

Fig. No.  
14—2



The existing conditions are shown on *Figure 14—1*.

### B. Accident Analysis

Six accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- All accidents occurred in 1988 and 1989. Four (67 percent) of the accidents occurred in 1989.
- Three (50 percent) of the accidents occurred on Friday, the remainder were randomly scattered over the remaining weekdays.
- All accidents occurred between the hours of 11:00 a.m. and midnight. Four accidents occurred during the noon and evening peak hours.
- Four (67 percent) of the accidents occurred on wet, snowpacked or icy streets.
- Five (83 percent) of the accidents were angle collisions.
- Speed and failure to yield the right-of-way were cited as the cause of four of the accidents. The other two were attributed to alcohol.
- None of the accidents resulted in injuries.

## SITE 14 INTERSECTION OF THOMAS AVENUE AND KOSSUTH STREET

### A. Description

This site is a 4-legged intersection located in the northeast residential section of Butte. The site is located 2 blocks east of Farragut Avenue. The surrounding development is single family residential. The north and south legs of the intersection are offset by approximately 30 feet. There are no street signs or traffic control devices at this intersection.

The 1990 average daily traffic is as follows:

Thomas—north leg .....	550 VPD
Thomas—south leg .....	510 VPD
Kossuth—east leg .....	350 VPD
Kossuth—west leg .....	400 VPD

An accident diagram is shown on *Figure 14—1*.

### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. The high incidence of angle collisions and failure to yield right-of-way indicates that STOP sign control may be required at this intersection. STOP sign control at Thomas and Moulton, Marcia and Wilson and Yale and Hancock have proven effective in reducing accidents at similar intersections.
2. The offset north and south legs of the intersection increase the exposure of north-south traffic crossing the intersection and reduces the east-west drivers' perception of the intersection. Installation of STOP signs on the north and south legs would eliminate this problem.

### D. Recommended Improvements

The following improvements are recommended for this site:

1. Install a 30" x 30", R1-1 STOP sign on the north and south approaches of the intersection. ....\$200
2. Paint 12" STOP lines on the north and south approaches. (*See Figure 11*) ...\$40
3. Paint curb to prohibit parking for 30' on all approaches. (*See Figure 11*) .....\$80

4. Install 12" x 18", R7-1L, "No Parking Here to Corner" signs on the north and south approaches. (See Figure 11) .\$200

Total Cost ..... \$520

Recommended improvements are shown on Figure 14—2.

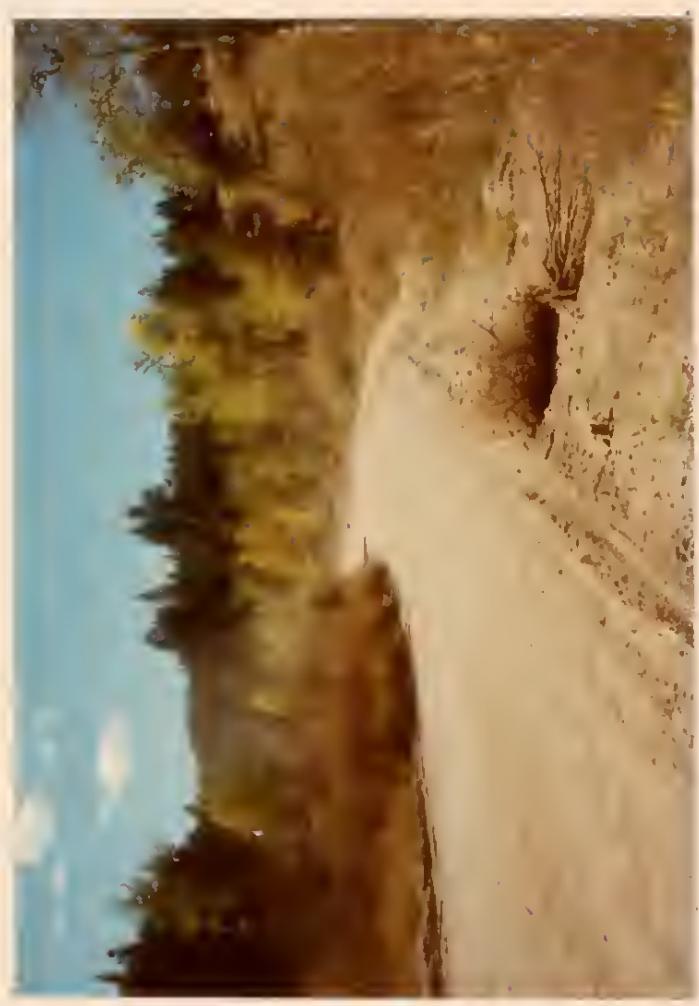
#### **E. Hazard and Priority Indices**

Based on the information collected and the foregoing analysis, the hazard index for this site is 40.99 and the priority index is 55.49.

SITE NO.15







**Site No. 15: Roosevelt Drive — Hill.** East approach of Hill on Roosevelt Drive looking west.



**Site No. 15: Roosevelt Drive — Hill.** West approach of Hill on Roosevelt Drive looking east.

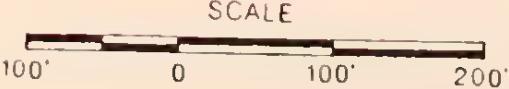
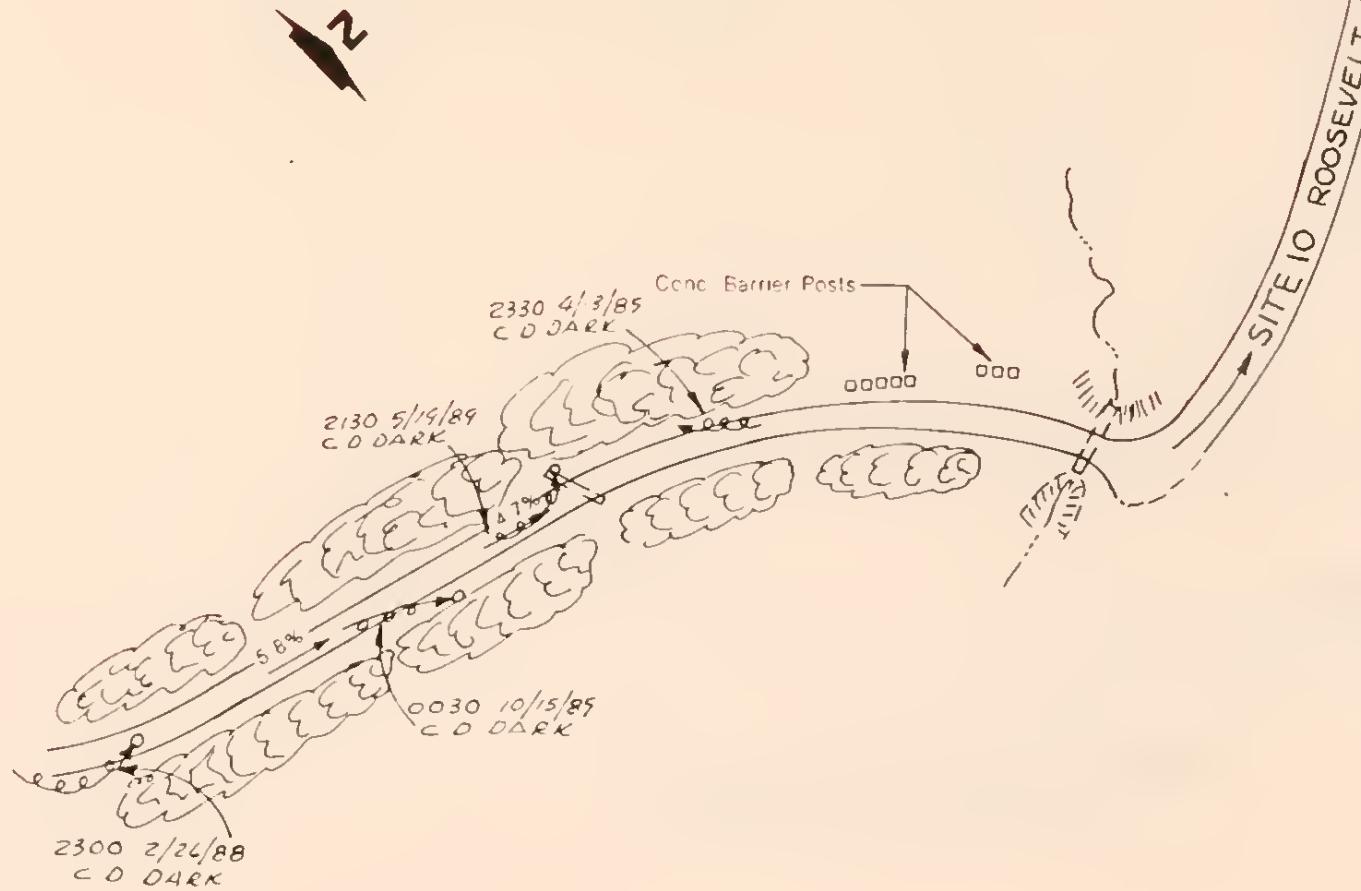


## Existing Conditions and Accidents

Roosevelt Drive - Hill

### SITE NO. 15

Burnt - Silver Bow County, Mt.



#### SYMBOLS

- Moving Vehicle
- Moving Vehicle
- ← Moving Vehicle
- Pedestrian Path
- Forked Vehicle
- Fixed Object
- Fatal Accident
- Injury Accident

#### COLLISION TYPES

- ↔ Rear End
- ↔ Head On
- ↔ Side Swipe
- ↔ Out of Control
- ↔ Left Turn
- ↔ Right Angle

#### CONDITIONS

WEATHER:  
F=Fog C=Clear R=Rain  
S=Snow SL=Sleet

SURFACE: D=Dry W=Wet I=Icy

TIME → 1600 7/2/82 ← DATE  
WEATHER → C D DARK ← LIGHT  
SURFACE

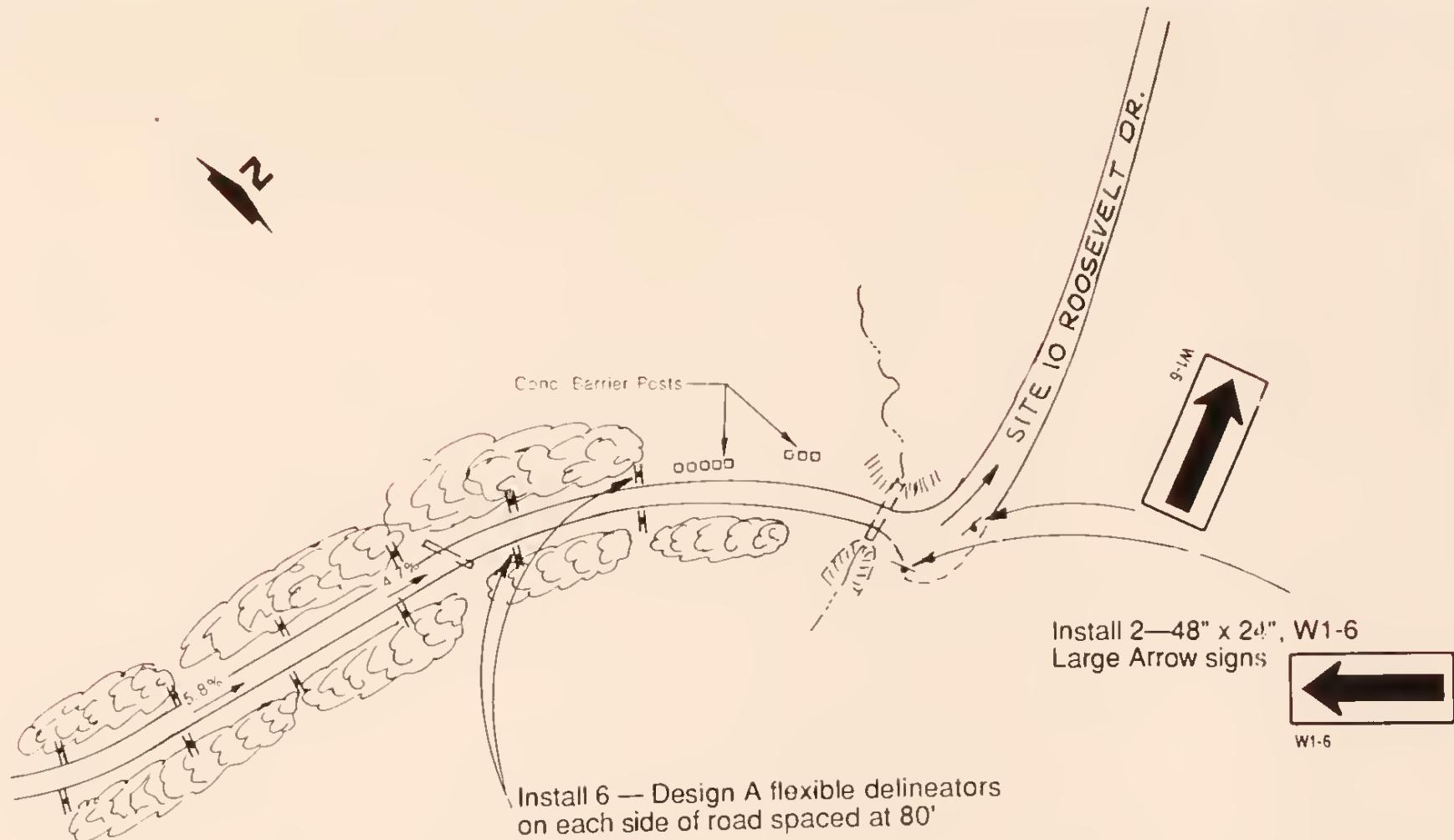
Fig. No.

15-1



**SITE NO. 15**

**Recommended Improvements**



SCALE  
100' 0 100' 200'

Fig. No.  
15-2



## **SITE 15**

### **ROOSEVELT DRIVE — HILL**

#### **A. Description**

This site is a hill located south of Site 10. The site has a 5—6% downhill grade into the west approach of Site 10. The road is 18' to 22' in width with a gravel surface. There are no traffic control devices on this section of the road.

The 1990 average daily traffic is 190 VPD. This section of road has the same traffic characteristics as Site 10.

A diagram of existing conditions is shown on *Figure 15—1*.

#### **B. Accident Analysis**

Four accidents occurred at this site during

the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- Half of the accidents occurred in 1988 and 1989.
- Half of the accidents occurred on weekends.
- There was no seasonal pattern to the accidents.
- All accidents occurred between 9:00 p.m. and 1:00 a.m. during hours of darkness.
- All accidents occurred on a dry road.
- All accidents involved single vehicles leaving the road. Three of the accidents involved northbound vehicles.
- Alcohol was involved in half of the accidents.

Accident diagrams are shown on *Figure 15—1*.

#### **C. Evaluation**

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. The major cause of accidents at this site is loss of control on the -5.8% northbound grade. The curve sign on the west approach of Site 10 will be effective in warning drivers of the upcoming curve and should decrease approach speeds and speeds on

the hill. Extension of the delineators up the hill will assist drivers in following the road alignment into the curve.

#### **D. Recommended Improvements**

The following improvements are recommended for this site:

1. Install 6—Design A flexible delineators on each side of road, spaced at 80'. \$240
2. Install 2—48" x 24", W1-6, large arrow signs on curve. .... \$240
Total Cost ..... \$480

Recommended improvements are shown on *Figure 15—2*.

#### **E. Hazard and Priority Indices**

Based on the information collected and the foregoing analysis, the hazard index for this site is 39.65 and the priority index is 54.48.



SITE NO.16







**Site No. 16: Farragut and Yale.** North leg of the intersection of Farragut and Yale looking south. *Note:* sight distance obstructions on east approach.



**Site No. 16: Farragut and Yale.** East leg of the intersection of Farragut and Yale looking west. *Note:* sight distance obstruction on northeast corner.



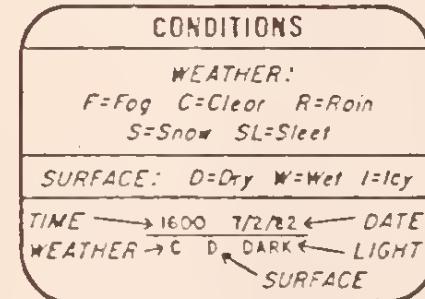
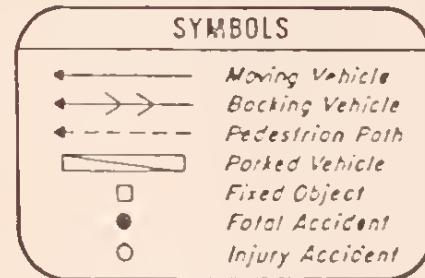
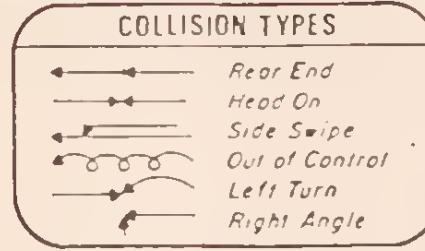
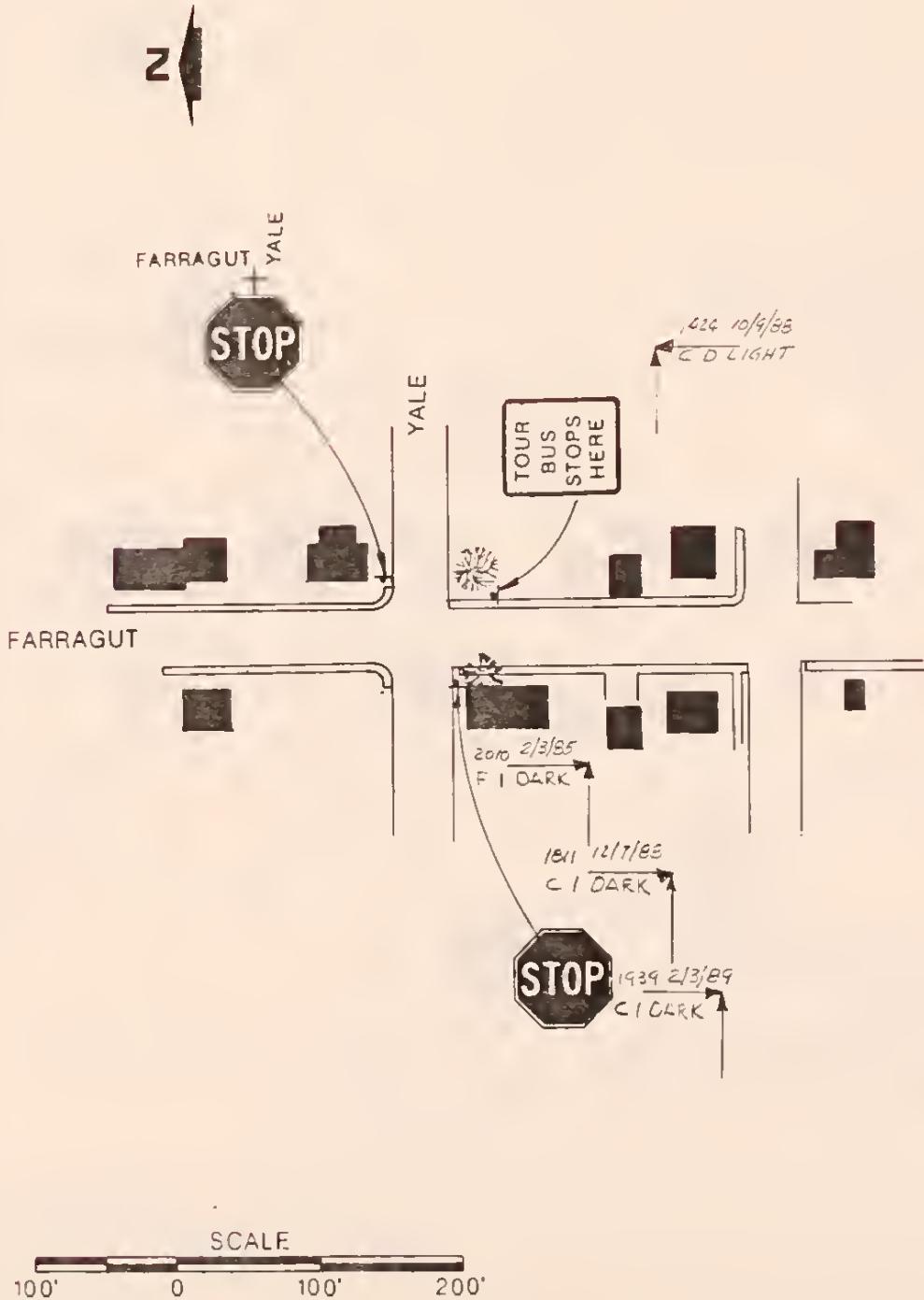
## SITE NO. 16 Existing Conditions & Accidents

Yale - Farragut

*Burre-Silver Bow County, Mt.*

Fig. No.

16-1





**SITE NO. 16** *Recommended Improvements*

Yale - Farragut

Butte-Silver Bow County, Mt.

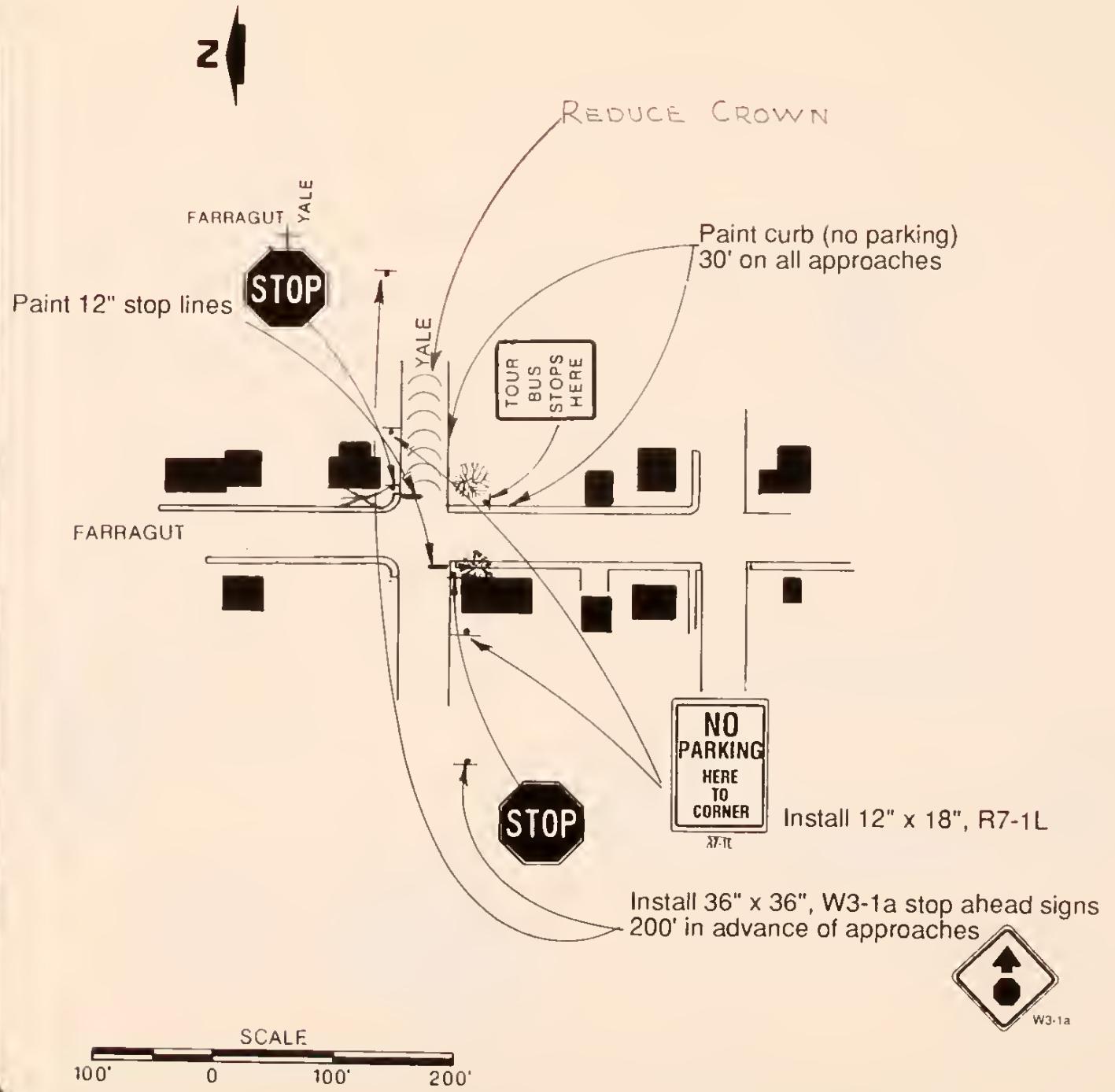


Fig. No.  
16-2



The 1990 average daily traffic is as follows:

Farragut — north leg ... 4650 VPD  
Farragut — south leg ... 4450 VPD  
Yale — east leg ..... 1050 VPD  
Yale — west leg ..... 930 VPD

Existing conditions are shown on *Figure 16—1*.

### B. Accident Analysis

Four accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- Three (75 percent) of the accidents occurred in 1988 and 1989.
- Two of the accidents occurred on Sunday and two on weekdays.
- Three (75 percent) of the accidents occurred during winter months, the other in the fall.
- All accidents occurred between the hours of 2:00 p.m. and 8:00 p.m.
- Three (75 percent) of the accidents occurred during hours of darkness.
- Three (75 percent) of the accidents occurred on an icy street.
- All accidents were angle collisions.
- Speed was cited as the cause of two (50 percent) of the accidents.
- None of the accidents involved alcohol

- None of the accidents involved injuries.

A diagram of the accidents is shown on *Figure 16—1*.

### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. All accidents at this site involved eastbound vehicles running the STOP sign on the west leg of Yak. Three of the collisions involved southbound vehicles on Farragut. Icy conditions accounted for three of the eastbound vehicles failing to STOP.

The sight distance from the west approach to the north, the primary collision approaches, is unobstructed. Signing and intersection marking appear to be the improvements that would be most effective at this site.

### D. Recommended Improvements

The following improvements are recommended for this site:

1. Install 36" x 36", W3-1a stop ahead signs on the east and west approaches. . \$280
2. Paint 12" stop lines on the east and west approaches. (*See Figure 11*) ..... \$40
3. Paint curbs on all approaches to prohibit parking for 30'. (*See Figure 11*) \$80

## SITE 16

### INTERSECTION OF FARRAGUT AVENUE AND YALE STREET

#### A. Description

This site is located at a 4-legged intersection east of Harrison Avenue and north of I-90. Farragut is a two-way, two-lane collector with parking both sides. Yak is a two-way, two-lane residential street.

The west approach has been patched and overlayed creating a hump or crown of approximately one foot. The owner of the residence on the southwest corner of the intersection says this has contributed to vehicles sliding to the curb during icy conditions.

The intersection is controlled by STOP signs on the east and west legs.

4. Install 12" x 18", R7-1L, "No Parking Here to Corner" signs on the east and west approaches. (See *Figure 11*) ..... \$200

5. Mill excess crown on west approach.  
..... \$400

Total Cost ..... \$920

Recommended improvements are shown  
on *Figure 16—2*.

#### **E. Hazard and Priority Indices**

Based on the information collected and  
the foregoing analysis, the hazard index  
for this site is 38.34 and the priority index  
is 53.50.

SITE NO. 17







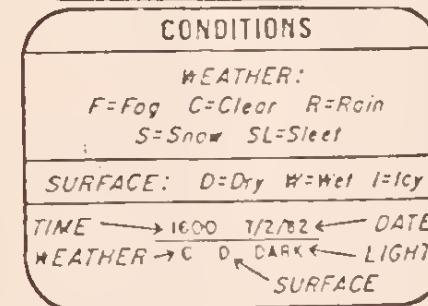
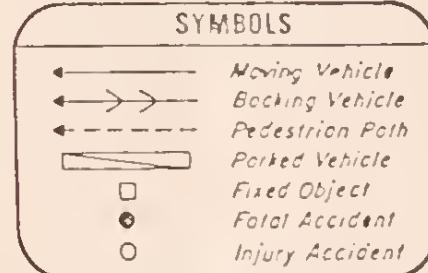
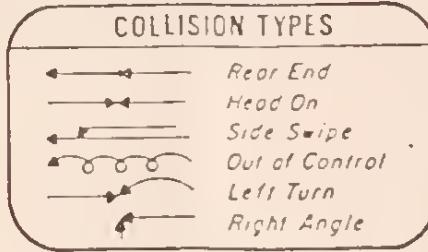
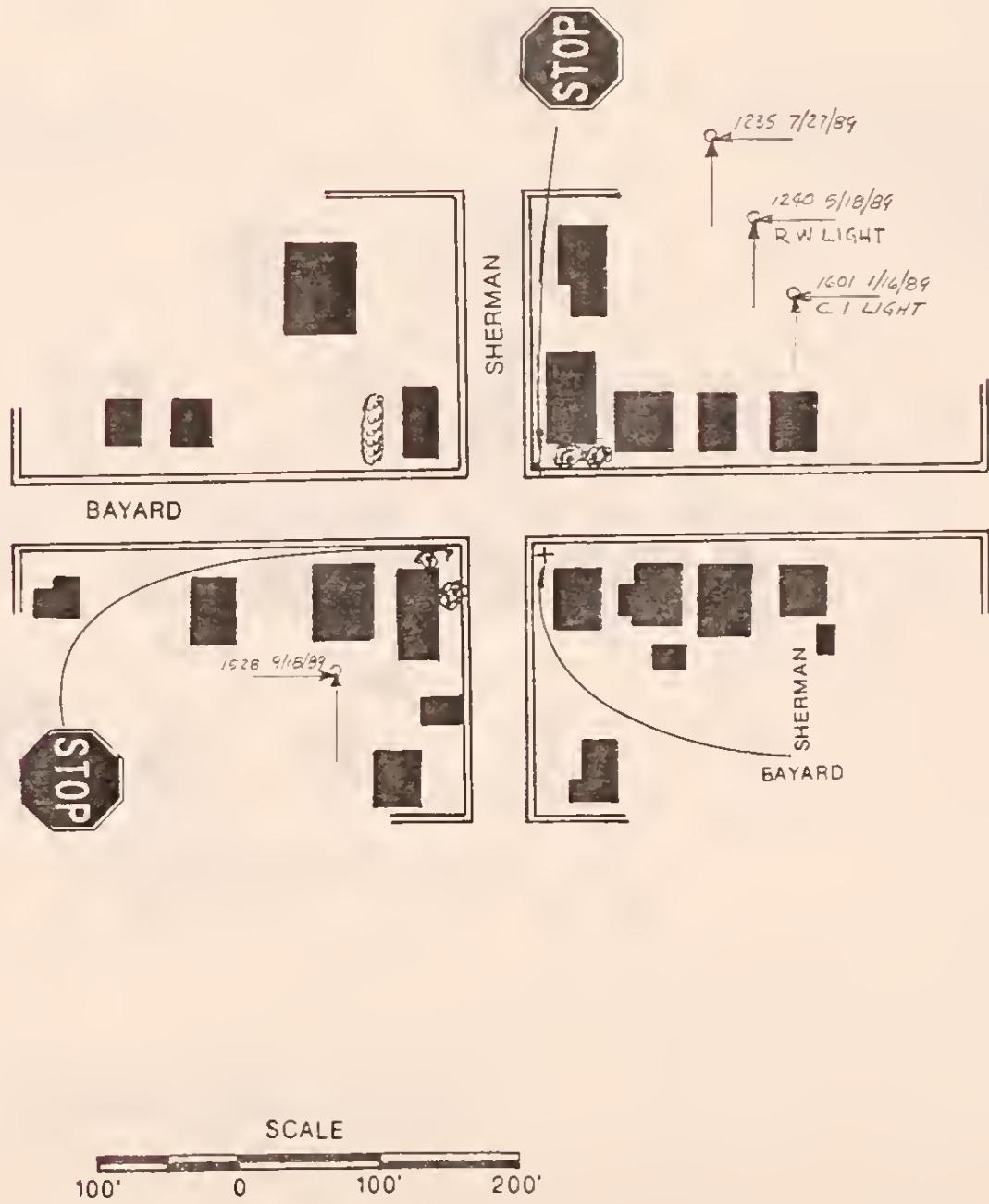
**Site No. 17: Sherman and Bayard.** West leg of the intersection of Sherman and Bayard looking east. *Note:* foliage screening STOP sign and skid marks.



**Site No. 17: Sherman and Bayard.** North leg of the intersection of Sherman and Bayard looking south. *Note:* limited sight distance on northwest corner.



N



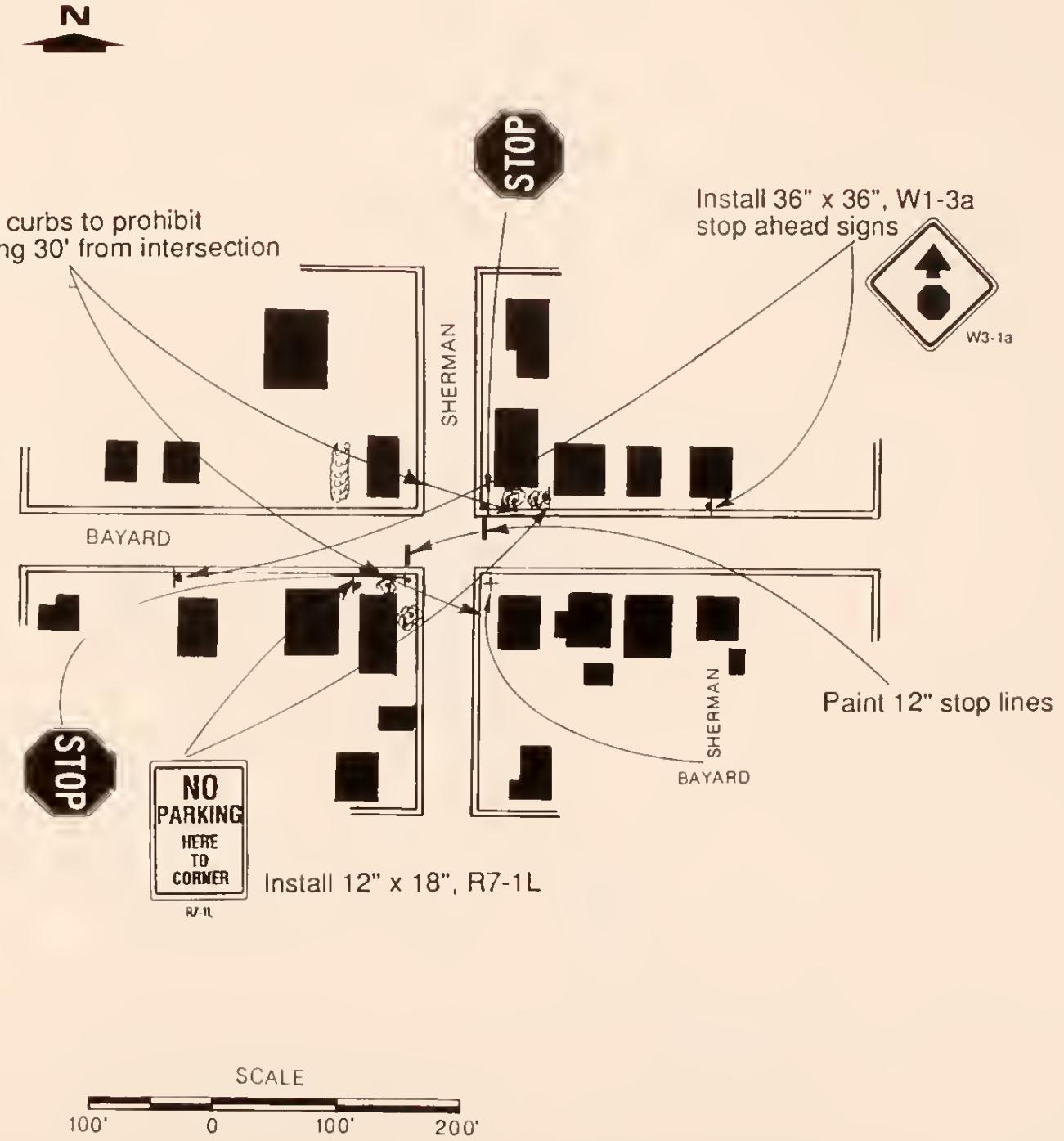
## SITE NO. 17 Existing Conditions & Accidents

Bayard - Sherman

Butte-Silver Bow County, Mt.

Fig. No.  
17-1



**SITE NO. 17*****Recommended Improvements***

**Fig. No.**  
**17—2**



## SITE 17

### INTERSECTION OF SHERMAN AVENUE AND BAYARD STREET

#### A. Description

This site is a 4-legged intersection located in the northeast residential area of Butte. Sherman is the major street running north-south. Bayard is a residential street in this area. The surrounding land use is single family residential. Sight distance is adequate on all corners. Traffic control devices at the site consist of STOP signs on Bayard.

The 1990 average daily traffic is as follows:

Sherman—north leg ..... 950 VPD  
Sherman—south leg ..... 880 VPD  
Bayard—east leg ..... 470 VPD  
Bayard—west leg ..... 500 VPD

Existing conditions are shown on *Figure 17—1*.

#### B. Accident Analysis

Four accidents occurred at this site during the five-year period from 1985 through 1989. The following is a summary of characteristics of those accidents that have been used to determine possible accident causes.

- All accidents occurred during 1989.
- All accidents occurred on weekdays.
- All accidents occurred between 12:00 noon and 4:00 p.m.
- One accident was attributed to icy road conditions.
- All accidents were attributed to failure to yield right-of-way.
- All accidents were angle collisions.

Accident diagrams are shown on *Figure 17—1*.

#### C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. The accidents at this site are typical of other sites in the neighborhood where STOP signs have been recently installed. The primary cause of accidents at this site resulted from drivers failing to observe the STOP signs on Bayard. Improvements

similar to other streets having this same accident pattern are recommended.

#### D. Recommended Improvements

The following improvements are recommended for this site:

1. Install 36" x 36", W3-1a stop ahead signs on the east and west approaches of the intersection. .... \$280
  2. Paint 12" stop lines on the east and west approaches to the intersection. (*See Figure 11*) ..... \$40
  3. Paint curbs at the intersection to prohibit parking for 30' on all approaches. (*See Figure 11*) ..... \$80
  4. Install 12" x 18", R7-1L, "No Parking Here to Corner" signs on the east and west approaches. (*See Figure 11*) ..... \$200
- Total Cost ..... \$600

Recommended improvements are shown on *Figure 17—2*.

#### E. Hazard and Priority Indices

Based on the information collected and the foregoing analysis, the hazard index for this site is 38.17 and the priority index is 53.38.





